THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

For the first time in several months, it is possible to note a slight improvement in the market. Several lots of Bessemer from Valley and more Western points, amounting to a round tonnage, which have been pressing the market, have been absorbed. Direct sales of Bessemer in the Pittsburg district in July were light, but amounted to nearly 20,000 tons, besides an equal or larger tonnage which went out subject to price adjustment at the end of the month. Sales for August will be much larger. Already this month over 10,000 tons of Bessemer have been sold, to consumers outside the Bessemer steel works. The steel corporation's pig iron committee will meet next Tuesday to consider August and September iron, and possibly also the fourth quarter. Independent steel works are expected in the market within a few days. After an absolute stagnation of nearly two months, inquiry for gray forge has appeared, one buyer desiring to do $16, delivered Pittsburg, on a 2,000-ton lot for August shipment, which the most active bidding of furnaces has not touched. The sale of 1,000 tons of Northern No. 2 foundry at $17, Pittsburg, is reported, while offerings of small lots of Bessemer iron for early shipment have been made at $17.25 to $17.50, Valley Furnace. The usual heavy specifications for plates from the steel car trade have been greatly curtailed, due to the falling off in car orders in the past three months and the cancellation of a number of unfinished orders for Western roads. To provide the independent sheet mills with bars, a steel plant with a daily capacity of 140 tons is to be built at Butler, Pa. The billet association is operating very smoothly. Ashland is the only mill of any consequence not represented. A fairly large tonnage has been booked, no sale since the full schedule for delivered prices was formulated having been of as much as 3,000 tons. Reports of large tonnages placed are entirely erroneous. Even before the formal agreement, the two largest lots were one of a little under 10,000 tons of high carbon steel and a lot of 11,000 tons for a Western wire interest. The members of the association all state positively that not the slightest shading has been done. Inquiry has been much heavier this week than in either of the two preceding weeks that the arrangement has been in force in all its details. In a rudimentary form, the present system was put in operation the middle of last June. On an inquiry for some ten thousand tons a steel mill has quoted nine dollars spread between Bessemer pig and four by four Bessemer billets, both for steel mill, which would take pig ton for ton in exchange for billets. Nothing has been done on this as the transaction would show a loss as compared with buying steel on straight delivered price. Nothing has been done in Southern pig in the Pittsburg district while in the West the leading agricultural interest has been in the market with an inquiry for twenty-two thousand tons, but reports that the order has been placed appear erroneous, although five thousand tons seem to have been placed at very close to $12 Birmingham for number two. The steel bar mills met Thursday of last week and officially decided to guarantee prices against a decline. This really entails no important concession, since without it the mills would not have brought pressure on customers to take tonnage they did not want, yet the action has had a very favorable effect, and orders are considerably heavier. The negotiations of a prominent consumer to get merchant steel bars below the association price have not been successful, although no order has been placed at the regular figure. A leading shape mill states that its tonnage of small orders in a normal year aggregates more than that taken on large contracts, and that this small business is coming in very freely. Many large projects are of course deferred to next year. Nothing below 2.70c is reported on sheets, and this price is made only by a few independent mills and by the leading interest to a few special customers. At this time last year sheet tonnage had shown a decided falling off, while now it is well maintained. Tin plates, wire products and merchant pipe are all rigidly firm, and all three lines are in better shape than at this time last year.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, }
429 PARK BUILDING, Aug 5. }

The iron and steel situation in this district has displayed no indications of improvement during the week. The pig iron market shows still further signs of weakness, while in some finished lines the specifications on contracts for delivery during this month are much smaller than they were during the month of July. The buying movement for forward movement is still being deferred and consumers look for still lower prices before invading the market.

A new low price has been established on Northern No. 2 foundry, a contract for 1,000 tons for delivery within the next few months having been placed at $17, Pittsburg, while a number of small lots, ranging from 50 to 100 tons, were sold at prices ranging from $17.25 to $17.50. Forge iron is being offered at $16.50, Pittsburg, and on a large tonnage it is probable that $16 could be done. Bessemer iron for early shipment is being offered at $17.50 to $17.75 at the Valley furnace, and despite these low quotations there is little changing hands.

The buying of steel since the late billet agreement has been exceedingly light, none of the orders calling for more than 2,000 to 3,000 tons. The steel mills that are parties to this agreement have established a uniform price of $9 per ton for conversion, and will deliver Bessemer steel for iron, ton for ton. Despite this high price it is possible to secure Bessemer iron at the present time at such prices, which, made into steel at the conversion price, can be sold at from 25 to 50 cents per ton below the pool quotations. A number of these arrangements are being considered at the present time by several large steel consumers. The conversion charge on sliding scale contracts for steel asked by the steel mills before the announcement of recent quotations was $7 for $17 Bessemer iron and $7.25 for $18 iron, which is considerably lower than the price for conversion asked at present.

Specifications for plates from the steel car plants have fallen off to a great extent during the past few weeks, and the steel car plants in this district have almost reduced their working forces by one-half. The railroads have placed very few orders for cars during the past three months and it is understood that a number of the roads, especially those in the West, believing that their rolling stock is ample to move the crops this year, have canceled portions of their unfilled orders for cars. The growth of this industry in the past few years has been at a tremendous rate, the capacity of the plants in this district alone being about 50,000 cars annually. The falling off in the manufacture of steel cars will not only cut into the consumption of plates very heavily, but structural shapes, steel castings and car wheels as well.

A steel mill for the production of sheet bars to supply the independent sheet mills is to be built shortly, plans already being prepared. The plant is not to be built by the independent

sheet interests jointly, one of the plans projected, but by outside interests entirely. The mill is to be built at Butler, Pa., and is to contain two 35-ton open-hearth furnaces with a capacity of 140 tons daily and a sheet bar mill.

The molders' wage scale applying to this district was adjusted last week, but there has been no settlement of the strike now on in the Youngstown, O., district. A lockout was inaugurated this week by the Builders' League against all trades affiliated with the Pittsburg Trades Council. Not more than 5,000 men are affected, however, as a number of unions have recently severed all relations with the Trades Council. It is believed that the lockout will be of short duration.

Pig Iron.—A meeting of the pig iron committee of the United States Steel Corporation will be held on Tuesday, August 11, and there is much conjecture as to what action will be taken. The Valley furnacemen are of the opinion that the buying of fourth quarter Bessemer iron at this time would help the situation considerably, and the buying of some basic and forge would materially reduce the tonnage that is being offered by the furnaces. It is doubtful whether any additional iron for August and September delivery will be purchased by the corporation, as excellent deliveries are being made on the iron purchased for this delivery several months ago. All irons continue to seek a lower level. The sale of 1,000 tons of No. 2 Foundry iron for delivery within the next few months at $17. Pittsburg, has established a new low level for this grade, while small lots are selling at $17.25 to $17.50. Offerings of Southern foundry No. 2 are heavy at $12, Birmingham, and it is reported that this could be shaded on a desirable tonnage. Forge iron is being offered at $16.50, and $16 could no doubt be done on a large tonnage. Bessemer iron for early delivery can be had at $17.50 to $17.75 at the furnace, and large buyers who have felt the market during the past ten days are now holding off until a still lower level is reached. Local agents of Virginia furnaces report the banking of two stacks on account of a lack of orders, and a third is preparing to bank. The stack of the Cherry Valley Iron Co., West Middlesex, Pa., which has been out for some time for repairs, was blown in last Saturday, but it is doubtful whether the other stacks in the Valleys out at present will come in before September 1. We revise quotations as follows:

Bessemer, Valley	$17 50 to 18 00
Bessemer, Pittsburg	18 35 to 18 85
No. 1 Foundry	17 75 to 18 25
No. 2 Foundry	17 00 to 17 50
Gray Forge, Pittsburg	16 25 to 16 50
Chilled Basic, Valley	17 65 to 18 00
Chilled Basic, Pittsburg	18 50 to 18 85

Steel.—There has been little buying of steel during the week, and the sales since the announcement of the recent schedule of prices have not been heavy. A steel plant to roll sheet bars is now projected and will be built at Butler, Pa. It will have a daily output of 140 tons. Agreed quotations are as follows: Bessemer billets 4x4 inches and slabs up to and including .20 carbon, $27, Pittsburg, Wheeling or Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O.; .21 to .60 carbon, $1 advance, and .61 to 1.00 carbon, $2 advance; open-hearth billets up to and including .60 carbon, $28, and over .60 carbon, $29; billets smaller than 3⅞-inch and sheet and tin bars are $1 per ton extra; Bessemer rods, $35.50 to $36 and open-hearth are held at $1 advance.

Ferro-Manganese.—Foreign and domestic, 80 percent, is held at $49 to $50 per ton, delivered in carload lots at buyer's mill.

Spelter.—There has been no change in the price of spelter during the week, while the buying has been exceedingly limited. We quote prime Western grades at 5.63½c to 5.65c, Pittsburg, in carload lots.

Muck Bar.—There is practically no buying of muck iron. Eastern mills are offering their product at $30, but it is doubtful whether the product of the mills in this vicinity could be had for less than $31 or $32 per ton.

Skelp.—The market continues quiet with 1.85c asked for grooved iron skelp and 1.90c for sheared. Steel skelp is held at 1.80c to 1.85c.

Rails and Track Material.—There have been no large contracts for rails booked during the week, although a number are still pending. We make the following quotations: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 8 pounds, in carload lots, $39; less than carload lots, $40; 12 pounds, $33.50; 16 and 20 pounds, $32.25 to $33; 25 to 40 pounds, $32 to $32.50. Track material: Spikes, 2.15c to 2.20c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 2c to 2.10c is asked.

Bars.—Sales of common iron bars calling for a round tonnage have been made by the largest producer on a basis of 1.75c, Pittsburg. While these sales were made at the minimum which this concern quotes in this district, another large producer is holding iron bars at 1.60c, Pittsburg, which is a drop of $1 per ton from the previous quotations. This price is about equal to 1.55c, Youngstown, and is below the price of steel bars. The current demand for steel bars is good and two contracts calling for 1,200 and 800 tons respectively have been placed with local mills this week. We make the following quotations: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.60c to 1.75c, Pittsburg. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

Plates.—There has been a big falling off in plate specifications from the steel car plants in this district and it is probable that some of the large plate mills will be compelled to shut down temporarily. Current business in plates is small and there are no large operations pending that will take any considerable tonnage. We quote: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plate 3-16-inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Structural Material.—There has been a slight falling off in specifications for structural material on the part of one large steel car producer in this district, due to the falling off in the demand for steel cars. Current demand for shapes is fair. We quote: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Pipes and Tubes.—A fair amount of new business in sizes under 4 inches is being placed, while the mills all have a large tonnage of the larger sizes on their books. We quote as follows in carload lots to consumers, f. o. b. Pittsburg, plus freight according to Tube Rate Book to destination:

MERCHANT PIPE.

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Wrought Iron Pipe. Black. Percent.	Wrought Iron Pipe. Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	65	53	61	50
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	66	54	62	51
Extra Strong Plain End				
⅛ to 8 inch	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End				
½ to 8 inch	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

Sheets.—The market continues quiet and there is little buying, despite the temporary concessions that have been offered to some of the largest consumers to place their orders at this time. Quotations on 500-bundle lots and over are as follows: Black sheets: No. 28, 2.70c to 2.75c; No. 27, 2.60c to 2.65c; No. 26, 2.50c to 2.55c; Nos. 22 and 24, 2.40c to 2.45c; Nos. 18 and 20, 2.30c to 2.35c; Nos. 14 and 16, 2.20c to 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.55c to 2.60c; No. 18, 2.80c to 2.85c; No. 26, 3.30c to 3.35c; No. 27, 3.55c to 3.60c; No. 28, 3.80c to 3.85c; No. 29, 4.30c to 4.35c; No. 30, 4.45c to 4.50c.

Wire and Wire Nails.—Jobbers continue to clean up their floors and are not buying for the fall trade. The mills with few exceptions are operating full but are stocking their output. We quote: Wire nails, carload lots, to jobbers, f. o. b. cars, Pittsburg, $2; plain wire, carload lots, $1.90; barb wire, carload lots, $2.30; staples, carload lots, $2.20. Galvanizing, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $2.15, and less than carload lots, $2.20 f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2.25 in carload lots and $2.30 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

Merchant Steel.—The market continues very quiet, with prices unchanged. We quote as follows: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots. Tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. Tool steel is quoted 7 cents and upwards, according to the grade.

Old Material.—We note the sale of a small lot of heavy melting stock at $18.50 gross ton, Pittsburg. Cast scrap is held at $17, gross tons, and No. 1 wrought at $17.50. Bushelling scrap is held at $15.50 to $16 in gross tons.

Coke.—The buying of coke is almost entirely limited to requirements for immediate consumption and there is little inquiry for forward delivery. Strictly Connellsville furnace coke is held at $2.25 to $2.75, and foundry at $3 to $3.25. Outside coke is being offered at prices ranging from $1.50 to $2 for furnace and $2 to $2.75 for foundry. For the week ending Saturday, July 25, the production of the Connellsville region reached 252,781 tons and that of the lower region amounted to 55,580 tons. There was a slight falling off in the shipments of the two regions during the week.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, Aug. 4.

There has been greater activity this week in pig iron. There are all the symptoms of heavy buying. The tonnage actually placed has been larger than at any time this year, and there are many inquiries that may be closed in the near future. In the products of the mills, trade has been reasonably good, but there is plainly perceptible a restraining influence, in the matter of free buying for the future. This is for the same reasons that have been adverted to heretofore, namely, a fear on the part of buyers that the market is not absolutely firm. There have been during the past week one or two slight recessions in prices, but they are explained, at least one or two of them, as being conversion deals, by which the buyer furnishes material and receives at a stipulated advance the finished product. In this matter what have heretofore been regarded as strong quotations have been shaded, though perhaps not for any large tonnage. There are heard rumors that some important business in finished products has been placed, but on the surface the situation is only moderately active. Buying of iron bars has increased somewhat, several good sized contracts for shipment during the last half of the year having been closed.

Pig Iron.—The internal affairs of the Southern association of pig iron producers have received at the hands of the trade more than ordinary consideration for several days past. There have been reports that one or two of the members would withdraw, in which event the previous official quotations would of course become a thing of the past. These reports, however, are not verified and are accepted with much disbelief. They are mentioned in this connection because their circulation has been a feature of the market recently. Of contrary import is the statement of one of the leading interests that there will not be a meeting of the association before Sept. 1, and not then if the market in the meantime evinces any notable activity. So far as has been made known, the association interests have adhered to the circular, though some evasions by way of special privileges have been alleged. At the circular price, $13.50, Birmingham, for No. 2 foundry, there has been sold during the past week an occasional carload and a semi-occasional lot of fifty tons, nothing more. The actual market is a thing apart from the circular prices, and this actual market is a shade lower than a week ago. The common quotation is $12.50, Birmingham, some little business being closed at $12.75. There are claims by buyers that they are offered iron at $12.25. One report is that an offer of $11.50 was made for a large lot of iron and that this was declined, but that a counter quotation was made at $12.25, which was declined by the prospective buyer. It is stated that the large implement maker last week bought over 5,000 tons of iron and the claim has been made that the consuming interest in question is now comfortably fixed with material up to November, a report that lacks official signature. In lots of from 200 to 500 tons quite a business has been done in the products of non-association Southern furnaces during the week, probably 5,000 tons. Silvery irons also have been fairly active. One seller of Jackson County silvery placed over 1,100 tons ranging from 6 to 10 percent up to $20.50 at furnace. But the feature of the Western market this past week was the largely increased sales of Northern irons. One of the largest buyers of malleable castings sent out an inquiry for 5,000 tons. This is said to have been placed with a Northwestern concern, and it seems to have started the purchase of malleable irons. Inquiry was large, and it is said that some 30,000 tons were bought for delivery during the last half of the year. The open quotation is $18 Chicago. There has been also good buying of Northern foundry irons during the week and there are many present inquiries, which are likely to be closed in the near future. Quotations are as follows:

Lake Superior charcoal	$21 00 to 21 50
Local Coke Foundry No. 1	18 00 to 18 50
Local Coke Foundry No. 2	17 50 to 18 00
Local Coke Foundry No. 3	17 00 to 17 50
Local Scotch Foundry No. 1	1800 to 18 50
Southern Coke No. 1	17 10 to 18 35
Southern Coke No. 2	16 60 to 17 85
Southern Coke No. 3	16 10 to 17 35
Southern Coke No. 4	15 60 to 16 85
Southern No. 1 soft	17 10 to 18 35
Southern No. 2 soft	16 60 to 17 85
Southern Gray Forge	15 35 to 16 60
Southern Silveries (4% to 5% silicon)	18 35 to 18 85
Southern Silveries (5% to 6% silicon)	18 85 to 19 35
Jackson Co. Silveries (6% to 8% silicon)	20 30 to 21 30
Jackson Co. Silveries (8% to 10% silicon)	21 30 to 22 30
Ohio Strong Softeners	21 00 to 22 00
Alabama and Georgia Car Wheel	26 35 to 27 35
Malleable Bessemer	18 00 to 18 50
Basic iron	16 85 to 17 85

Billets.—A Western consumer bought 3,000 tons of Bessemer billets at $28, Chicago, the order being divided between two sellers. A Wisconsin sheet mill is said to be inquiring for sheet bars. Forging billets have had a limited vogue at about $33.

Bars.—There has been some revival of interest in bars. The tonnage closed has not been in excess of that for the previous week, perhaps, but is wider in extent. Large lots of iron can be bought close to 1.60c, Chicago, but for moderate lots, 1.65c is the usual quotation, some business being slightly higher. The large producers of steel bars are holding firmly to 1.60c, Pittsburg, or 1.76½c, Chicago, but this price is reduced $1 per ton by an outside Eastern mill. There is a steady trade from store, but usually in small lots. We quote mill shipments, Chicago delivery:

Bessemer steel, 1.76½c; angles, less than 3x3, 1.86½c base; hoops in lots of 250 tons and greater, 2.06½c; less than this amount, 2.16½c; iron, 1.70c to 1.75c. Quotations from store, steel, 2c; iron, 2c to 2.10c; hoops, 2.40c to 2.50c; angles, 2.25c rates.

Sheets.—There is moderate inquiry for sheets and trade is moving at the slight concession recently made effective. We quote mill shipments, carload lots, Chicago delivery, as follows: No. 27 black, 2.75c to 2.85c; No. 28, black, 2.85c to 2.95c. Galvanized 75 and 10 to 75 and 10 and 2½ percent. On lots from store, we quote No. 27 black, 2.95c to 3c; No. 28 black, 3.05c to 3.10c. Galvanized, 75 percent to 75 and 2½ percent.

Plates.—The mills are running full on the large specifications lately placed and the tone of the market is firm. We quote mill prices, Chicago delivery, as follows. Tank steel, ¼ inch and heavier, 1.75c; flange steel, 1.85c. Prices for lots from stock: Tank steel, ¼ inch and heavier, 2.15c to 2.25c; 3-16, 2.25c to 2.35c; No. 8, 2.30c to 2.40c; No. 10, 2.35c to 2.45c; flange steel, 2.40c to 2.50c.

Structural Material.—The most promising department of structural material is bridge work. There is excellent inquiry from some of the Western roads, that will have to add largely to their bridge capacities during the coming year. But buildings are not now an active part of the business. Some of the structures that were reported closed a few weeks ago have been withdrawn from the market since then. There is a very fair activity in construction work throughout the West, but it is mainly small buildings that are under way, calling for comparatively few shapes. We quote mill prices, Chicago delivery: Beams and channels, 16 inches and under, 1.75c; 18 inches and over, 1.85c; universal plates, 1.75c; angles, 3x3 and larger, 1.75c; tees, 3x3 and larger, 1.80c; zees, 1.75c. Lots from store, 2¼c per pound.

Merchant Steel.—There is an improved buying in merchant steel. The large consumers have allowed the buying of their material to drag later than usual and are forced to conclude contracts. There are now under way an increased number of contracts and the tonnage placed last week was larger than for some weeks past. The market is firm. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 and 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than carload lots, 42 percent off.

Merchant Pipe.—It has been another good week for pipe. The mills are still behind in the production of large sizes and the volume of business is eminently satisfactory for this time of year. We quote carload lots mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ⅜ in. inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	71.85	61.85
7 to 12 inches inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ percent advance over above prices.

Boiler Tubes.—Consumers are now ordering for October shipments. They are not diminishing their specifications, the trade being large and prices firm. Quotations below are on carload lots, mill shipments, f. o. b. Chicago. On less than carload lots, 12½ percent is to be added:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	43.35	38.35
1¾ to 2½ in.	55.85	35.85
2¾ to 5 in.	60.85	45.85
6 to 13 in.	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	40	35
1¾ to 2½ in.	50	32½
2¾ to 5 in.	57½	42½
6 to 13 in.	50	32½

Cast Iron Pipe.—There has been some further decline in the price of pipe this past week and the reductions have brought out some increased business. It is mainly small lots that are bought, but the aggregate tonnage is large. Car loads are quoted, f. o. b. Chicago, 4-inch water pipe, $31; 6-inch, $30; 8-inch and upwards, $30; gas pipe, $1 a ton higher.

Rails and Track Supplies.—There is still a large tonnage of requirements for next season under negotiation and trade for the present year's shipments is quiet. We quote standard sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; rails, 25 pounds, $32 to $34; 12 pounds, $39 to $40; regular differentials for intermediate sizes. Track supplies, mill shipments: Angle bars, 2c to 2.10c; spikes, first quality, 2.25c (out of store, carload lots, 2.35c to 2.45c rates); second quality, 2.10c; track bolts, 3½x¾ with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3c to 3.10c, with usual differentials for other sizes.

Wire and Wire Nails.—The mills are behind in filling orders for plain wire, the wire fencing being in especially heavy demand. Barb wire is relatively quiet. Nails are moving in small lots, but there are small stocks in the possession of both jobbers and dealers. Prices are firm. Quotations to jobbers, Chicago delivery, are as follows: Wire nails, carload lots, $2.20; less than carload lots, $2.30. Cut nails, steel, carload lots, $2.26½; less than carload lots, $2.36½c. Plain wire, $2.10 carloads, and $2.20 in small lots; galvanized, carloads, $2.40; smaller lots, $2.50. Barbed wire, carloads, $2.50; less than carloads, $2.60; galvanized, carloads, $2.80; less than carloads, $2.90; staples, carloads, $2.30; smaller lots, $2.40; galvanized, carloads, $2.60; small lots, $2.70. Bale ties, 82½ and 5 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Coke.—The coke market is shrinking into lesser proportions, but the same conditions are apparent. Although jobbers are ordering little coke forward that is unsold, buyers are able to pick up enough lots at concessions to satisfy their wants and for spot delivery the market is therefore weak. On contracts it is different to buy under $3.50 at ovens for Connellsville foundry. West Virginia grades of furnace coke are selling at $2 ovens or $4.65, Chicago.

Old Material.—Trading in old material may be a little brisker. In spots, where demand has sprung up there is an improvement in the quotations, but they are the exception and the drift of the market generally seems to be downward. In the aggregate there is little buying, but the trade hopes for a revival of interest later in the month. Dealers' selling prices in gross tons are as follows:

Old iron rails	$19 00 to 20 00
Old steel rails (mixed lengths)	16 50 to 17 00
Old steel rails (long lengths)	19 00 to 20 00
Relaying rails	29 00 to 31 00
Old wheels	19 50 to 20 00
Heavy melting steel	15.50 to 16 50
Mixed country steel	12 50 to 13 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$14.25 to 14.50
No. 2 R. R. wrought	13.75 to 14.25
Shafting	15 50 to 16 50
Dealers' forge No. 1	12 50 to 13 50
No. 1 busheling and wrought pipe	11 50 to 12 00
No. 1 cast	14 00 to 15 00
Heavy cast (300 pounds and over)	10 00 to 10 50
Country malleable	12 50 to 13 00
Iron axles	19 00 to 19 50
Steel axles	17 00 to 17 50
Cast borings	5 50 to 6 50
Mixed borings, etc	5 50 to 6 50
Wrought turnings	10 50 to 11 00
Machine shop turnings	10 50 to 11 00
Iron axle turnings	11 50 to 12 00
Steel axle turnings	11 00 to 11 50
Stove plate and light cast scrap	10 00 to 10 50
Old iron splice bars	15 50 to 16 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Aug. 5.

The total shipments of ore for July show a marked decrease as compared with last year, although several ports increased their shipments.

The shipments to Aug. 1 were as follows:

	1903	1902
Escanaba	2,144,588	2,546,861
Gladstone	25,942	46,882
Duluth	2,745,845	2,634,231
Marquette	1,040,564	1,318,206
Ashland	1,434,064	1,786,254
Superior	2,081,981	1,858,487
Two Harbors	2,852,659	2,782,298
	12,325,643	12,973,219

The loss to Aug. 1 is 647,576. For the month of July the movement was 3,425,810 tons against 4,073,386 in July, 1902. The shipments are, however, far ahead of those of 1901, which to Aug. 1 of that year were 8,661,431 tons.

Pig Iron.—Prices are tending downward, but inquiries are more numerous and many sales of small lots of foundry iron have been made. Southern Ohio iron is selling at $16 for No. 2 at the furnace as the usual quotation, but a lower quotation could be obtained for a large order. In the northern part of the state the usual price is $17 at the furnace. Sales of Southern iron are reported at $12, Birmingham, for No. 2 by independent furnaces, with rumors of still lower quotations, but small sales for prompt shipment have been made at $12.50. We quote, f. o. b. Cleveland, with the exception of gray forge, which is quoted at Valley furnace:

Bessemer	$18 35 to 18 60
No. 1 Strong Foundry	17 75 to 18 25
No. 2 Strong Foundry	17 00 to 17 50
No. 3 Foundry	16 50 to 17 00
Scotch No. 1	18 50 to 19 00
Scotch No. 2	17 75 to 18 25
Gray Forge, Valley furnace	17 00 to 17 50
Lake Superior charcoal	23 00 to 23 50

Coke.—There is considerable complaint about car shortage. Connellsville is selling at $3.10 to $3.25 for foundry at the ovens. Other cokes are much lower.

Finished Material.—Jobbers complain of dullness in nearly all lines. There is nothing but current business and competition for that is keen. Not for a long time has there been so much activity of sales agents over small orders. Bar iron is weak and there are reports of very low quotations. The usual quotation is 1.60c Cleveland. The price of steel remains at 1.60c for Bessemer and 1.70c for open-hearth, and orders are not numerous. Out of stock iron and steel are selling at the same price, 1.90c. The sheet situation is quiet, although there have been usual efforts to interest buyers. Consumers say they are not getting lower prices, in spite of recent reports. The prices of the principal producer through jobbers continue as follows: Galvanized sheets, mill sales, carload lots, Nos. 10 and 11, 2.60c; Nos. 12-14, 2.70c; Nos. 18 to 21, 3c; Nos. 22 to 24, 3.20c; Nos. 25 and 26, 3.55c; No. 27, 3.80c; No. 28, 4.05c; No. 29, 4.45c; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75 and 5 off. For 3-16-inch black sheets and heavier we quote 2.15c, Cleveland. Mill sales of black sheets to consumers are made on the following basis: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c. The following are prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.60c to 2.70c; Nos. 18-20, 2.75c to 2.85c; Nos. 22-24, 2.85c to 2.95c; Nos. 25-26, 2.95c to 3.05c; No. 27, 3.05c to 3.15c; No. 28, 3.15c to 3.25c.

Old Material.—The mills have not yet started to buy, but inquiries are more numerous and sales of good size are expected soon. We quote as follows, f. o. b. Cleveland, all gross tons:

Old iron rails	$19 00 to 20 00
Old steel rails (over 6 feet)	18 00 to 19 00
Old steel rails (6 feet and under)	17 00 to 18 00
Old car wheels	17 00 to 18 00
No. 1 R. R. wrought	17 00 to 18 00
Mill scrap	14 00 to 15 00
No. 1 machine cast scrap	14 50 to 15 00
Iron axles	22 00 to 23 00
Steel axles	22 00 to 23 00
Axle turnings	14 00 to 15 00
Wrought turnings (free from cast)	13 00 to 14 00
Cast borings	7 00 to 8 00
Uncut wrought iron boilers	9 00 to 10 00
Steel boiler plates	14 00 to 15 00
Grate bars	10 00 to 12 00
Pipes and flues (clean)	14 00 to 16 00
Tank iron	14 00 to 16 00
Hoop and band iron	10 00 to 12 00
Sheet iron	8 00 to 9 00
Wrought drillings	12 00 to 13 00
Malleable iron (railroad)	18 00 to 19 00
Malleable iron (agricultural)	15 00 to 15 50
Stove plate	11 00 to 12 00
Heavy steel	17 00 to 18 00

CINCINNATI.

Aug. 4.

It seems proper to preface the pig iron market report this week with some attempt to describe the unsettled conditions prevailing. The trade is so full of rumors and stories which, if true, would have an important bearing on the situation, that a proper idea of the market can not be presented without taking them into account. Interest centers on what the attitude of the Association of Southern furnaces will be, now that the market has gone so much below the last schedule fixed by the association. It has been repeatedly rumored that the association was on the point of disbanding and calling all agreements off, letting the market take care of itself. This, however, is emphatically denied and the latest advices from Birmingham are to the effect that the associated furnaces propose to stand by their last schedule and wait for the demand to take the iron. To offset this comes strong evidence that the product of two of the furnaces in the association has been practically offered at $12 Birmingham. Letters from the sales agents for these furnaces have been quoted asking for a tender of business at $12 Birmingham. The principals of these two furnace companies in the South say that if their agents put out such literature it was done without authority. There is hardly an association furnace that has not been charged with offering iron below the schedule. These stories have naturally had some influence on the situation; in fact, one independent furnace after having turned down an order at $12 Birmingham, concluded to book the business on the strength of the talk that was going the rounds.

Pig Iron.—The market continues easy and unsettled. For No. 2 foundry $12 Birmingham has been done and at the southern Ohio furnaces $15.50 has been reached. These prices have been done beyond any doubt and strong talk of $11.50 Birmingham and $15 in southern Ohio is freely circulated, but the latter figures are not confirmed. A prominent pipe consumer was in the market this week and took about 5,000 tons of various grades on the basis of $12 for No. 2 foundry, $11.50 for No. 3, $11.00 for No. 4 Birmingham. This was the only large order reported. The inquiry is still for small lots and there has been no change in the character of business or the volume of sales. The lower grades of iron are very weak, and mottled and gray forge are dull. On gray forge $10.25 Birmingham is reported to have been done in St. Louis territory. It seems to be perplexing the selling contingent to account for the small amount of iron being taken by the consumers. One explanation offered that seems to be reasonable and to some extent account for this, is that when melters placed orders ahead for requirements to July of this year, they based their wants on more active conditions than have prevailed in the first half of this year. Therefore their purchases have covered their requirements for a longer period than they thought at the time they ordered. This has also deceived the seller who figured that buyers had only covered to July 1, whereas, now that we have passed the first of August the seller finds that no pronounced buying movement has started. The following are the prices current f. o. b. Cincinnati:

Southern Foundry No. 1	$15 50 to 16 00
Southern Foundry No. 2	15 00 to 15 50
Southern Foundry No. 3	14 50 to 14 75
Southern Foundry No. 4	14 25 to 14 50
Southern Foundry No. 1 soft	15 50 to 16 00
Southern Foundry No. 2 soft	15 00 to 15 50
Gray forge	13 50 to 14 00
Northern Foundry No. 1	16 65 to 17 15
Northern Foundry No. 2	16 15 to 16 65
Southern car wheel iron	26 25 to 27 25

Finished Material.—The leading interest has sent out a notice to the trade guaranteeing prices on bar steel and small shapes. This has had some effect in stimulating a steadier feeling, but on the whole trade has been light and the market quiet. There has been no change in prices, but an easy undertone prevails. Buyers are holding off and the volume of business is small. In bar iron 1.70c

base can be done on any large business offering, but the ruling quotation on carload lots is 1.73c base, the same as for steel. Iron bars, car lots, are quoted at 1.73c to 1.75c base, half extras. Steel bars remain at 1.73c base, half extras, with the retail price 2c base, half extras, for both out of store. Galvanized sheets are being quoted at 75 and 5 percent off. We quote black sheets No. 27 at 2.78c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.10c; No. 27, 3.20c; No. 16, 2.65c; No. 14, 2.55c; No. 12, 2.45c; No. 10, 2.35c. Tank plates are firm and sell out of store at 2.15c for ¼-inch and 2.25c for a 3-16-inch. Beams and channels are quoted at 2.15c to 2.25c from stock, and angles at 2.15c and 2.25c for base sizes. In merchant pipe there has been no change and the market holds steady. A few independent mills are said to be making prices just enough below the schedule to book some business, but there is not sufficient of this going on to disturb the market as a whole. The outlook now is for a continuance of present prices on boiler tubes. In this line a steady to strong tone is reported.

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	63.7	53.7
½ inch	68.7	58.7	65.7	55.7
¾ to 6 inch, inclusive	73.7	63.7	70.7	60.7
7 to 12 inch, inclusive	67.7	57.7	64.7	54.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	35.2
1¾ to 2½ inch	54.2	34.2
2¾ to 5 inch	59.7	44.2
6 to 13 inch	54.2	34.2

Old Material.—The market is still dull and easy, but there is no change in prices reported. We quote:

Old No. 1 railroad wrought, net tons	$14 00 to 15 00
Cast machine and foundry, net tons	12 00 to 13 00
Old iron rails, gross tons	19 00 to 20 00
Old steel rails, gross tons	17 00 to 18 00
Old short lengths, gross tons	14 50 to 15 50
Old iron axles, net tons	20 00 to 21 00
Stove plate, net tons	9 00 to 10 00
Wrought turnings, net tons	11 00 to 12 00
Cast borings, net tons	6 00 to 7 00

PHILADELPHIA.

Aug. 4.

The general tone of the market, in spite of shading on several lines, is stronger. It is evident that there will be large requirements for early deliveries, and large inquiries are coming for large amounts for later delivery. There is no sign of an early rush for material, but consumers will be compelled to buy more extensively than they have been doing. The billet pool has saved billets from the threatened weakening tendency and that market will now hold its own. Many buyers of steel are waiting, not so much for lower prices as for certain evidence that steel makers have reached a position where they can hold their own. There are just enough indications of urgent necessities on the part of the country at large to tone up the entire market a little, notwithstanding the general lowering of the level of prices. The next spurt in demand necessarily will be in steel billets, after that in Bessemer pig, then in structural and plate iron, which will be followed by a heavy demand for steel rails in the autumn amounting to not less than 500,000 tons of which 90,000 will be bought abroad for Gulf and Pacific Coast deliveries, provided the German makers can give the right figures.

Pig Iron.—The volume of business has increased somewhat, but prices are lower. It is reported that 40,000 tons of basic has been sold at $16.50 delivered, while other grades, when taken in 500-ton lots, were at equally low prices. We quote: No. 1 Foundry Standard brands delivered, $18.50 to $19.00; No. 2 X Foundry Standard brands, $17.25 to $18.00; No. 2 Foundry plain brands, $16.75 to $17.00; gray forge, standard brands, $16.75 to $17.25; gray forge, ordinary, $16.25 to $16.50.

Steel.—It is rumored that a 20,000 ton lot of foreign steel has been sold for this market at a trifle less than $27.50 ex-ship, but the sale needs confirmation. Basic is offered from local mills at $28.50 to $29 and Bessemer $28.25.

Finished Material.—The feeling is one of considerable disappointment, as the amount of business coming in is much below what the mills require to keep them fully employed. Prices are nominally unchanged, but they are weak, and orders easily placed at inside figures. We quote:

Plates—Small lots, 1.80c to 1.85c; carload lots, ¼-inch and thicker, 1.73c to 1.75c; flange, 2c; marine, 2.10c to 2.15c; fire box, 2.20c to 2.25c.

Bars—Prices for carloads are usually quoted at from 1.65c to 1.70c for refined iron and 1.70c to 1.75c for steel bars.

Structural Material—Beams, angles and channels, ordinary sizes, 1.73½c to 1.80c for carload lots, with the usual addition for smaller quantities.

Old Material.—Sellers are more anxious for business, and prices are easier with most sales at inside figures. Prices below fairly represent the market for deliveries in buyers' yards, as well as can be represented when there is little or nothing doing: Old steel rails, $18.50 to $18.75; miscellaneous heavy steel scrap, $17.75 to $18.25; low phosphorous scrap, $26 to $27; old steel axles, $21 to $22; old iron axles, nominal, $23 to $24; old iron rails, nominal, $20.50 to $21; old car wheels, nominal, $20 to $21; choice scrap railroad No. 1 wrought, $18 to $19; country scrap, $16.50 to $17; machinery cast, $17 to $17.50; No. 2 light scrap (forge), $17 to $18; No. 2 light scrap (ordinary), $12 to $13; wrought turnings, $13.50 to $14; wrought turnings, choice heavy, $14.50 to $15; cast borings, $9 to $9.50; stove plate, $12 to $12.50.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 4.

Pig Iron.—Dullness continues to be the main characteristic of the market. Only, it would seem, when they are in actual need of iron, do consumers increase their holdings. Rumors of lower values are constantly being circulated, with Philadelphia advices of that character plentiful. While the market is far from being strong, still it is not so weak as some describe it. New York prices are as follows: Northern No. 1 X foundry, $17.25@$18; No. 2 X foundry, $16.50@$17.50; No. 2 plain, $16.25@$17.00; Southern No. 1 foundry, $17.25@$17.75; No. 2 foundry, $16.75@$17.25; No. 3 foundry, $16.25@$16.75; No. 4 foundry, $15.75@$16.25.

Billets.—German basic billets are quoted at $27, New York delivery, duty paid, but the probabilities are a good customer could do better.

Finished Iron and Steel.—On the whole, the finished material market during the week was quiet. There are a great many large propositions for structural market hanging fire, but the parties are slow to close contracts. Bars continue to be vulnerable, but there is not the same pressure to sell at concessions. In plates, trade is becoming restricted, particularly in large orders. In sheets, it is said, the leading interest is inclined to get nearer independent mills' prices. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 1.80c to 2c; flange, 2.00c to 2.10c; firebox, 2.25c to 2.30c; refined iron bars, 1.75c to 1.80c; soft steel bars, 1.70c to 1.75c; steel sheets, in car loads, New York, No. 28, black, 2.90c to 3.05c; galvanized 75 and 2½ off.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 4.

Pig Tin.—The strength which developed in the market last week was increased during the past week, the scarcity of stocks giving speculative interests further encourage-

ment in putting up prices. New business, however, did not follow in the train of the upward movement, buyers believing that the cause which made it possible was temporary, and that lower prices would come with the return of normal conditions. The monthly statistics compiled by Secretary Mayer, of the Metal Exchange, show spot stocks in the United States to be 919 tons, the smallest ever known, and London stocks 4,314 tons, which will make this market subservient to that center. During the week the London market advanced sharply, prices showing increases of over £1 on the average. Closing prices today at the Metal Exchange were as follows: Spot, 28.80c to 29c; August, 28.10c to 28.25c. London closed today as follows: Spot, £127 2s 6d; futures, £123 17s 6d. Arrivals at Atlantic ports for the month to date aggregate 125 tons, with 1,995 tons afloat.

Copper.—The market is quiet, with limited purchases the rule, and the belief that prices will be lower prevalent. The shading of "official" prices to the extent of ¼ cent per pound is said to be going on. There is absolutely no interest in the situation shown by buyers. London furnished higher quotations almost daily during the week, spot being particularly strong. Closing prices today at the Metal Exchange were as follows: Lake and electrolytic, 13¼c; casting, 12¾@13c. London's closings today follow: Spot, £58; futures, £55 10s. Statistics show exports for July to have been 8,405 tons, against 10,717 tons last year. For the seven months ending July they were 72,242 tons, against 106,011 tons for a similar period last year.

Lead.—Spot is weaker at 4.20c, with August at 4.12½c. St. Louis is lower at 4.10c. London is easier at £11.

Spelter.—Is quiet and unchanged at 5⅞c. St. Louis is a shade higher at 5.60c. London slightly lower at £20.

Antimony.—Cookson's is 7½c, Hallett's 6½c, and outside brands, 6¼c.

Quicksilver.—Still quoted at $47.50 per flask of 76½ pounds in lots of 100 flasks. London unchanged at £8 2s 6d.

Nickel.—Is selling at 40c to 47c for large lots down to a ton, and 50c to 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, July 28.

There has been better buying of copper this past week, although prices are lower. Consumers have allowed stocks to become almost depleted. Lake has sold at 13⅛ to 13¼c in car load lots and casting at 12⅞ to 13c in car loads. Lead is $3 per ton higher. Old metals are shrinking in value in sympathy with copper. Pig tin is quoted 29c; pig lead, 4.25c in 50 to 100-ton lots, and 5c to 5¼c in lesser quantities; spelter, 5½c in carload lots, and 6c to 6¼c in lesser quantities; sheet zinc, 6¼c; antimony, 10¾c to 11c for Cookson's, and 9¾ for Hallett's. We quote old metals as follows: Copper wire, 11¼c; heavy copper, 11¼c; light copper, 10¼c; heavy red brass, 11½c; light brass, 10¼c; red turnings, 9¼c; yellow turnings, 7¼c.

The Colorado Fuel & Iron Co. has taken the first decided step to break the machinists' strike at Pueblo. Fifty machinists arrived a few days ago from Cleveland and were installed in comfortable quarters inside the works. Pickets did not succeed in stopping the Cleveland men.

Twenty-two carloads of galvanized corrugated sheet metal left the works of the Berger Mfg. Co., Canton, O., for the Philippine Islands last week. The steel is to be used in the construction of barracks for the United States troops in the islands.

The Simonetta file plant will not be located in Massillon, O., as was expected. There was disagreement among the promoters and Rudolfo Simonetta has returned to Italy. It is said he will establish a plant at Turin.

President Schwab Resigns.

President Schwab, of the United States Steel Corporation, tendered his resignation of the presidency at a meeting of the directors held in New York, Aug. 4. Wm. E. Corey was unanimously elected his successor.

Mr. Schwab will continue as a director of the steel corporation and a member of its finance committee. Formal announcement of Mr. Schwab's resignation was made in the following form:

"Mr. Schwab, in consequence of continued ill health, tendered his resignation as president, and it was accepted. W. E. Corey, who has been for some time performing the active duties of the president, was elected to the vacancy. The office of chairman of the board of directors was created and E. H. Gary was elected to the position and will continue to devote his entire time to the business of the corporation. An advisory committee, to consist of three directors, besides the president, to consider and make recommendations concerning questions of manufacturing, transportation and operation, was created and E. C. Converse, William Edenborn and D. G. Reid were elected as members of this committee. Mr. Schwab will continue to be a member of the board of directors and of the finance committee."

Immediately after the election of his successor Mr. Schwab met the press representatives to whom he made this informal statement:

"I want to say that I think I have been treated very unfairly by the newspapers in regard to the reasons for my retirement. A number of reasons, including this American Shipbuilding matter, have been given for it, but none of them is true. As a matter of fact the shipbuilding question has never been a subject of discussion between myself and the directors. On my return from Europe six months ago I tried to get Mr. Morgan and the directors to accept my resignation, but was unable to do so. That does not look as if I had been forced out. Later I appealed to Mr. Frick and through him have finally succeeded in inducing the directors to accept my resignation. I am as deeply interested in the United States Steel Corporation as ever. I am still the largest stockholder and remain as director and member of the executive committee. As a result of the meetings this afternoon my work has been divided.

"The new president is a close personal friend and has succeeded me in all the offices I have held. My retirement is on account of ill health—nervousness. I have been in bad health for six months or more."

J. P. Morgan made a statement as follows:

"I deeply regret that the condition of Mr. Schwab's health renders it impossible for him to continue at the head of the steel corporation. His loyalty to the interests intrusted to him cannot be doubted, and from the early days of the inception of the corporation he gave to its formation, unification and development his unequaled powers as an expert in the manufacture of steel."

The new president has entered upon his duties and it may be authoritatively stated with his election the steel corporation has inaugurated a new policy. There will be less centralization of power and increased responsibility in the work of the various committees. President Corey will devote his entire attention to the practical and technical parts of the steel and iron industry and will receive material aid from the advisory committee, whose members are specially well qualified to act in that capacity. Contrary to reports no other important changes were announced in the personnel or policy of the corporation. Mr. Frick continues a member of the finance committee, of which George W. Perkins is chairman.

The furnace of the Cherry Valley Iron Co., West Middlesex, Pa., which has been out for repairs for some time, was blown in this week.

The offices of Eliot A. Kebler, dealer in pig iron, have been removed from room 620 Farmers' Bank Building, Pittsburg, Pa., to rooms 1501 and 1502.

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A YEAR'S IMPORTS OF IRON AND STEEL.

In June of last year, there was a large increase in imports of steel, the total for that month being 35,588 tons. This year the imports for June, as shown by the report of the Treasury department, were 30,503, or about 5,000 tons less than for the same month of 1902; but the total imports of steel for the six months are far in advance of those for the same period of 1902, being more than double, while the imports of pig iron are nearly four times those of the half year ending with June, 1902. The imports of iron and steel for the first six months of 1902 and 1903 were as follows in gross tons:

	1902.		1903.	
	Pig Iron.	Steel.	Pig Iron.	Steel.
January	7,633	5,312	110,679	38,691
February	8,307	2,235	45,187	20,151
March	17,184	6,570	59,628	31,464
April	19,067	11,986	99,944	29,014
May	30,708	24,383	57,139	26,389
June	32,458	35,588	79,874	30,503
	115,357	86,074	452,451	176,203

The rapid increase in imports of pig iron and steel during the past year ending with June is from 158,961 tons of pig iron to 956,198 tons, and from 90,426 tons of steel to 379,476 tons. The imports of iron and steel rails increased from 15,017 tons to 122,994. Those of tin plate decreased from 88,337 tons to 49,068 tons. The figures in detail are as follows:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	June,		Twelve months ending June,	
	1902.	1903.	1902.	1903.
Pig Iron	32,458	79,874	158,961	956,198
Scrap	12,760	17,634	49,188	135,901
Bar Iron	976	4,239	22,281	43,167
Iron and Steel Rails	5,931	11,026	15,017	122,994
Hoop, band or scroll	1,541	155	5,233	1,562
Steel Ingots, Slabs, Billets or Bars	35,588	30,503	90,426	379,476
Sheets and Plates	799	1,052	8,002	8,063
Tin and Terne Plates	5,817	3,871	88,337	49,068
Wire Rods	2,361	1,964	17,181	22,990
Wire and Wire Articles	295	384	4,225	3,832
Total	98,526	150,702	458,851	1,723,251

From 1850 to 1903, the only years in which the value of iron and steel imports exceeded those of 1903 were 1872, 1873, 1880, 1881, 1882, 1883 and 1891, all years of great business activity, but in no former year were such large importations made in the face of such immense home production of iron and steel as that of 1903. For example, in 1891, when the importations were $2,000,000 larger than in the year just ended, the production of pig iron was only half that of the year 1902. In the early eighties, pig iron production was only one-quarter of that of the present. The total value of iron and steel imports for June, not including ore, but including some manufactures of iron and steel not named in the above table, is $4,604,777 against $3,635,930 in June, 1902. For the twelve months, the totals are: 1903, $51,617,312; 1902, $27,180,247. For the year the ore imports were 1,043,565 tons in 1903 and 1,189,732 tons in 1902.

The decrease of exports for the year is nearly 200,000 tons. For the period, the value of exports, not including ore, but including some manufactures not named in the table, was for 1903, $96,642,467 and for 1902, $98,552,562. For the month of June the value of exports was $8,472,942 in 1903 and $7,771,991 in 1902. The following table gives the exports for the articles named:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	June,		Twelve months ending June,	
	1902.	1903.	1902.	1903.
Pig Iron	2,085	1,653	54,704	18,198
Scrap	799	600	13,496	6,043
Bar Iron	5,623	2,580	20,121	18,117
Wire Rods	1,487	3,148	12,253	31,834
Steel Bars (not wire rods)	569	659	14,686	12,990
Iron Rails	8		640	81
Steel Rails	7,507	842	166,816	22,896
Billets, Ingots and Blooms	106	30	2,907	2,127
Hoop, Band and Scroll Iron	176	142	1,741	1,669
Iron Sheets and Plates	269	226	4,253	2,879
Steel Sheets and Plates	1,850	1,116	12,724	14,144
Tin Plates, Terne Plates and Toggers' Tin	256	2	1,074	683
Structural Material	1,784	3,093	61,190	32,952
Wire	8,961	9,106	99,640	100,121
Cut Nails	426	799	6,860	7,168
Wire Nails	2,826	2,081	20,722	28,109
Other Nails, including Tacks	102	209	1,834	2,481
Total	34,834	26,286	495,661	302,492

Obituary.

James M. Mungiven, a well known resident of Brooklyn, N. Y., died July 23, age 50 years. Mr. Mungiven was born in Springfield, O. For 15 years he was manager of the S. A. Ilsley Tinware Co., Brooklyn, N. Y.

Col. John Paul Jones, the first manager of Amanda Furnace in Boyd County, Ky., opposite Ironton, O., abandoned many years ago, died at his home in Ashland, Ky., July 28, aged about 80 years. He was a son-in-law of the late General Lindsey Poage, one of the original iron masters of the Hanging Rock region, and Amanda Furnace perpetuated the name of his wife.

E. K. Hayes, of Galva, Ill., died July 25, age 55. Mr. Hayes had long been engaged in the business of manufacturing farm implements and had invented a number of machines.

No. 2 stack of the Carnegie Steel Co., at New Castle, Pa., which has been in operation since December, 1872, was blown out on Saturday, Aug. 1, and will be torn down to make room for a more modern plant which will have a daily capacity of 600 tons. This stack was originally built by Raney & Berger, and was later sold to the Shenango Valley Steel Co. This concern was later absorbed by the National Steel Co., which was later taken over by the United States Steel Corporation. The furnace came under the jurisdiction of the Carnegie Steel Co. when the American Steel Hoop and National Steel companies were absorbed by this concern. The stack is 75x18½ feet and was rebuilt in 1883.

Philadelphia Machinery Market.

Aug. 4.

The market is dormant. Buyers and sellers alike are inactive. It is the vacation season, and this year it is being taken advantage of to the fullest extent. Business men are tired and many prominent in the machinery world are welcoming the present lull as an opportunity to take a much needed rest. That the condition of the market is only temporary is evidenced by the large number of inquiries for machinery of all kinds coming in. A feature of this prospective business is the fact that the requirements are not particularly urgent, and deliveries called for consequently somewhat extended. Pessimists are seeing in general conditions a decline in the general prosperity of the country, but in the face of things there is nothing alarming in the situation. For three or four years business has gone on incessantly summer and winter, and little chance for rest has been presented. Now conditions have changed somewhat. The abnormal volume has given way to the normal, and opportunities for relaxation are gladly seized.

Along the line of supply there is much relief. Iron castings are easily obtained, and with much more promptitude than heretofore. Steel castings, too, are turned out in less time than has been the case for a year or two. Bar steel, and the hundred and one other things entering into the make-up of machinery, can be obtained with some degree of promptness, and work is easier in consequence.

The bulk and nature of the inquiries coming in are very gratifying, and a sure indication that the demand is likely to remain at a normal point for some time to come. September promises to be the forerunner of many months of great activity.

The foreign demand is very light, few inquiries only being reported. However, such concerns as have established European agencies report good business, with a likelihood of its continuance.

E. Harrington, Son & Co. have commenced work on their new $125,000 buildings at 18th and Hamilton Sts. It is a matter of speculation as to what will be done with their present buildings, but it is considered an easy guess that they will pass into the possession of the Baldwin Locomotive Works, whose buildings for some time have encompassed the Harrington plant. The new Harrington plant will extend from a building already in use by them for some time for the manufacture of hoists and lighter lines. They report business as being very good with them, in point of both inquiries and orders.

Thos. H. Dallett & Co., makers of portable drills, pneumatic tools and other specialties, have merged into a new corporation to be known as Thos. H. Dallett Co., with Thos. H. Dallett president, Ernest C. Bliss vice president and general manager, and E. C. Clay secretary and treasurer. W. H. Van Sickel, lately the New York representative of the Under-Feed Stoker Co. of America, and formerly identified with pneumatic tool interests, is the superintendent. It is proposed to add considerably to their shop equipment in the near future, and to extend their business in pneumatic tools.

While there has been a falling off in the influx of business to the Baldwin Locomotive Works, the fact excites little or no comment. They have been abnormally busy for some time and there is enough work in hand to last more than a year even though they should not take another order. Orders have come in to them with little effort on their part to get them, and the present condition of things at the works is highly satisfactory. Among recent bookings they report an order from the Southern Railroad for 90 locomotives of different types, for delivery within twelve months.

The T. C. Dill Machine Co., which makes a specialty of slotting machines, has a good deal of business in hand. Its line is becoming well and favorably known and it has not wanted for orders. Recent orders booked include an 18-inch slotter for Pawling & Harneschfeger, Milwaukee, Wis., who already have installed a 15-inch machine of the same type; and a 21-inch machine for the Milwaukee shops of the Allis-Chalmers Co.

At the George Richards Corliss Engine Works business is very good, and enough orders are in hand to keep the plant busy for several months to come. Orders are very largely from local sources and cover Corliss engines up to 500 h. p.

The Keystone Machine Tool Works have a good many orders in hand and report a brisk inquiry for their different lines of tools. They have in course of construction a large horizontal floor boring machine, which when completed will weigh 25 tons, on an order received from an Eastern concern. The machine has a 14-foot horizontal traverse, with a 6-foot vertical adjustment and a work table 12 feet x 10 feet. Among their July shipments was a very large slab milling machine to New York parties.

The Turner Machine Co., builder of automatic cock grinders and molding machines, reports a good month's business for July. Besides smaller transactions, it had an order from an Erie, Pa., concern for a large eight-spindle cock grinder.

The Hess Machine Works, builders of file making machinery, report business as fully up to the average of preceding months, with domestic business rather better than the foreign, which latter has always predominated. Some nice orders from France, Sweden and Italy are in course of fulfilment at the works.

The Eynon-Evans Mfg. Co., maker of condensers, jet blowers and engineers' supplies, ended its business year on July 1 and is receiving the congratulations of its friends on its being the banner year in the history of the company. It is now occupying the additions to its plant and has most of its new equipment in place, and the succeeding year promises almost a 50 percent increase in its capacity. Mr. T. M. Eynon leaves this week on a flying trip to Europe, which will constitute a well earned vacation.

The Philadelphia Pneumatic Tool Co. reports its business for July as fully up to the standard of its business for several months past. Among orders received were some from the Clairton Steel Co., Clairton, Pa.; Farrell Foundry & Machine Co., Ansonia, Conn.; Bagley & Sewell Co., Watertown, N. Y.; Abendroth & Root Mfg. Co., Newburgh, N. Y.; Sterling Co., Barberton, O.; Rome Locomotive & Machine Co., Rome, N. Y.; Cleveland Steel Casting Co., Cleveland, O.; Norfolk Navy Yard, Portsmouth, Va.; Delaware & Hudson Ry., Albany, N. Y.; Craig Shipbuilding Co., Toledo, O.; Rogers Locomotive Wks., Paterson, N. J.; Lehigh Foundry Co., Fullerton, Pa.; Dearborn Foundry Co., Chicago, Ill.; Phœnix Iron Works, Meadville, Pa.; Franklin Rolling Mills Co., Franklin, Pa.; Baker & Shevlin Co., Saratoga, N. Y.; Fort Wayne Elec. Co., Fort Wayne, Ind.; Aultman & Taylor Mfg. Co., Mansfield, O.; Shackleton Whiteway Construction Co., Butte, Mont.; T. A. Gillespie Co., New York; American Bridge Co. (2 plants); Bates Mfg. Co., Lewiston, Me.; Bethlehem Steel Co., Bethlehem, Pa.; Jenks Machine Co., Sherbrooke, Pa.; J. G. Brill Co., Philadelphia; Glamorgan Pipe & Foundry Co., Lynchburg, Va.; and Amoskeag Machine Co., Manchester, N. H.. The demand from the company's foreign agencies was very good.

The Newton Machine Tool Works are occupying their new building, and work in hand is being expedited in consequence. Business is in good shape but not quite as heavy as earlier in the year. For the first half of the year, however, it shows an increase of 25 percent over last year. During July they shipped a number of tools of standard sizes, chiefly rotary planers and cold saws. Several machine tools were shipped to plants of the American Locomotive Works, including four milling machines. Several cold saws and boring machines were shipped to the shops of the Lehigh Valley Railroad. Foreign shipments included a milling machine to Berlin, Germany, and a cold saw cutting off machine to Australia.

The next regular meeting of the New England Foundrymen's Association will be held Aug. 12, 1903. A special boat will leave Hale's Wharf on South Water St. (East Side), Providence, R. I., at 11:30 a. m. for Field's Point, where a Rhode Island Clambake will be served at 12 o'clock. After the dinner the party will leave the Point on the special boat for a sail down Narragansett Bay, arriving in Newport about 3 o'clock. Carriages will be furnished members for the 10-mile drive in and about this famous summer resort, after which the party will again board the boat. Lunch will be served on the return trip, and the boat will arrive in Providence in time to take the 7:55 p. m. train for Boston.

The Labor Situation.

LOCKOUT IN PITTSBURG.

The Builders' League, of Pittsburg, Pa., this week locked out the trades affiliated with the Pittsburg Trades Council, and it is estimated that about 5,000 men are idle. Work on a number of large buildings has been stopped, although the George A. Fuller Co. did not cease work on a number of its buildings. The lockout has by no means affected all of the building trades, as a number of unions allied with the Trades Council recently severed all connections with that body. The lockout will be of short duration, as the differences existing between the two bodies will no doubt be arbitrated.

Intolerable Interference.

The plant of the Brown Cotton Gin Co., Bath, Maine, has been closed for an indefinite time. This is a case of a fair and reasonable concern, with a good history on labor matters, held up by the unreasonableness of the machinists' union. This action in closing the plant came as the result of many interferences of the union, the last of which was the preventing of a machinist who was not a member of the union from going to work. President Brown said:

"Among other things, the machinists' union insists that we see to it that members of that body pay their dues. An incident occurred recently. A first class machinist was alleged to be in arrears and as usual the union insisted that we force the man to pay up. The committee that waited on me said the machinists would strike if the man continued in the shop. The man in question afterward came to me and stated that he had satisfied the union that he was paid until Aug. 1, but owing to the prominence the case had attained he was going away. He secured a position in Pennsylvania and we lost a good man. Other little interferences with our plan of doing business became more and more frequent. Recently the machinists' union notified the company that on Aug. 1 that body would issue a schedule of prices that should be paid for the different kinds of work in the shop. Friday morning one of the foremen discharged a man and told him to go to the superintendent. Another man in the shop, an influential member of the union, told him to remain at work, and the discharged man remained, in spite of the order of the foreman."

THE PITTSBURG AGREEMENT.

The foundrymen and molders of the Pittsburg district reached an agreement last week at a conference held in Pittsburg, the scale to date for one year from July 1. The minimum of $3 for a nine-hour day continues in force, but a straight advance of 10 cents per day is granted all molders and coremakers dating from July 1. This agreement, however, does not affect coremakers who are at present working for less than $3 per day, or establish any precedent in the ratio of wages between molders and coremakers if at a national conference between the National Founders' Association and the Iron Molders' Union of North America the minimum rate of coremakers should be established at a rate less than $3 per day, the rate for all coremakers working under this agreement shall be changed to this rate. The agreement is as follows:

This Agreement, made and entered into this thirtieth (30th) day of July, 1903, by and between a committee representing the Manufacturers' Association of Pittsburg and the members of the National Founders' Association of Pittsburg and vicinity, constituting the party of the first part, and a committee representing the members of the Iron Molders' Union of North America, in the Pittsburg District, party of the second part, for the purpose of securing and preserving just and equitable conditions of labor in the workshops of the first party, whereby the interests of the employer and employe shall be properly protected; and for the further purpose of avoiding strikes and lockouts by settling all disputes that may hereafter arise between the members of the parties hereto, during the term of this contract, in an amicable and equitable manner.

1st. That any disputes or difficulties arising between the parties hereto during the term of this agreement, shall be settled strictly in accordance with the New York agreement.

2d. That nine (9) hours shall constitute a day's work. All time worked over nine (9) hours in any one day shall be considered overtime.

3d. Time-and-half time shall be paid for all over-time, and double time shall be paid for Sundays, Fourth of July, Labor Day, Thanksgiving Day and Christmas.

4th. There shall be no restrictions or fines placed on a molder for the purpose of preventing him in any way from putting forth his best efforts to produce the best quality and quantity of work and receiving compensation accordingly.

5th. The party of the first part shall have the privilege of introducing molding machines and improved appliances of any kind in their foundries, and the right to have same operated by parties of the second part or any other parties they may find best adapted to operate said machines.

6th. That the party of the first part will refuse to employ any apprentice who has started his trade with another firm and has not completed his regular apprenticeship, unless said apprentice receives the consent of the firm he started his apprenticeship with. It is also agreed that apprentices shall be given work in all branches of the molding trade.

7th. The minimum rate of wages per day of nine (9) hours, during the term of this contract, shall be $3.00 per day for journeymen molders and coremakers working in machinery shops. It is understood, however, that this is not to affect coremakers who are at present working for less than $3.00 per day, or establish any precedent in the ratio of wages between molders and coremakers and if at a National Conference between the National Founders' Association and the Iron Molders' Union of North America, the minimum rate of coremakers should be fixed at a rate less than $3.00 per day, the rate for all coremakers working under this contract shall be changed to that rate.

8th. An advance of 10 cents per day shall be paid to each journeyman molder and coremaker, beginning July 1st.

9th. It is further understood that any National Agreement that may be perfected between the National Founders' Association and the Iron Molders' Union of North America, during the life of this agreement, shall go into effect at once, as between the members of these two associations, and that nothing in this agreement shall be understood as conflicting with any said National Agreement.

10th. This agreement shall remain in force from July 1, 1903, to July 1, 1904, and thereafter, unless thirty (30) days' notice shall be given in writing, by either party, that they wish to terminate this agreement.

(Signed)

GEO. MESTA,
ISAAC W. FRANK,
For committee representing the Manufacturers' Association of Pittsburg and the members of the National Founders' Association of Pittsburg and vicinity.

JOHN BARNETT,
THOS. F. CONNOLLY,
For committee representing the Iron Molders' Union of North America in Pittsburg and vicinity.

THE SITUATION IN NEW YORK.

NEW YORK, Aug. 5.—The labor situation hereabouts in machine shop, forge and foundry lines, is satisfactory in the extreme. The strike of the marine machinists is still on, but in name only, as no difficulty has been or is experienced in filling strikers' places.

LABOR NOTES.

The strike of employes of the Buffalo Union Furnace Co. is still on. The company is still willing to deal with the American Federation of Labor and is willing to have its employes organize as a branch of the Federation, but

is not willing to have any relations with the local union which broke its contract in ordering the strike.

The following concerns have signed the Amalgamated Association scale during the week: The Chicago Steel Mfg. Co., Hammond, Ind.; the Crescent puddle mill, Crucible Steel Works of America, Pittsburg, Pa.; the Laughlin Nail Co., Martins Ferry, O.; the top mill sheet department, Wheeling Iron & Steel Co., Wheeling, W. Va.; the Louisville Bolt & Iron Co., Louisville, Ky.

The strike of machinists at the plant of the Westinghouse Machine Co., East Pittsburg, Pa., continues in force and the ranks of the strikers have been further augmented during the week. The strikers claim that fully 500 men are out, while the statements of the company place the figure at 300. There is little likelihood that the strike will be settled and, if the men want to return, they must do so as individuals.

The strike of the tin plate workers at the plant of the McKeesport Tin Plate Co., McKeesport, Pa., continues in force, although the company is experiencing little trouble in operating its ten mills. Much ill feeling has already been displayed and two strikers were shot last week by a party of non-union men leaving the mill.

The Norton Iron Works, Louisville, Ky., has resumed operations after several months' idleness caused by labor troubles which have been settled to the satisfaction of all concerned.

Building contractors and employes of Chicago have formed a peace council which, it is hoped, will do much to prevent the wage conflicts which have recently occurred in that city. Plans for the joint board of employers and employes have been drafted, and sent out to the 30 building trades unions and all contractors affiliated with the Chicago Mason and Builders' Association and several other organizations of contractors. The plant provides for a joint council of 60 men—30 employers and 30 workers, one contractor and one unionist from each trade. This board will have power to take up all disputes, but minor controversies will be referred to an arbitration committee of the larger body. No strike or lockout can be declared while the board exists, until an effort to arbitrate has been made.

The machinists and boilermakers in the Northern Pacific shops, Spokane, Wash., have been granted an increase of wages from 34 to 37 cents per hour. The new wage scale will date from July 16.

A mass meeting of citizens of Michigan City, Ind., was held recently to protest against the work of labor agitators in interfering with the operation of the plant of the Haskell & Barker Car Co., whose proprietors declared they would quit business rather than have the unions dictate to them. The meeting expressed confidence in the company and denounced agitators.

About 20 employes of the Vulcan Iron Works, Toledo, have gone on a strike because the company requires the employes to wear numbered badges for convenience in recording time.

A conference between the molders and the manufacturers of the Youngstown, O., district was held on Saturday, Aug. 1, for the purpose of adjusting the differences existing on account of the presentation of the molders' new wage scale, and which has resulted in the closing of nearly all of the foundries at Youngstown, Niles and Girard. No agreement was reached and it is probable that no further effort will be made to adjust the differences until after the Atlantic City conference to be held shortly. The conference was brought about through the intervention of James H. Nutt, of the Republic Iron & Steel Co. The molders agreed to accept $3 as the minimum and a 10-cent advance and further agreed to insert any and all clauses affecting their scale that would be agreed upon at the national conference. The manufacturers, on the other hand, stood out for the $2.90 minimum and a straight advance of 10 cents per day. The molders will insist on the $3 minimum, as they are attempting to establish this rate as a standard throughout the country before attempting to secure a higher rate.

The board of review of Chicago continues to hear statements from manufacturing concerns which ask that their tax assessments be decreased for the reason that strikes have injured their business. Last week the Schroeter Mfg. Co. and the

The boiler makers and iron workers at the plant of the Detroit Shipbuilding Co. have returned to work after being on a strike for eight weeks. They accepted the terms of the Detroit Employers' Association. There was no recognition of the union.

F. P. Smith Iron & Wire Works sent representatives to the board stating that they had been compelled to close their plants two or three months early in the year, that their business had suffered, and that their stocks were lower by half than they were last year.

REVIEW AND FORECAST OF SHIPBUILDING.

Very little of an encouraging nature concerning shipbuilding or the American merchant marine in the foreign trade of the United States is to be noted in this year's Blue Book of American Shipping, which is just from the press. Rather, indeed, is foreign shipping still dwindling, since no new vessels have been ordered for this service. The Blue Book, issued annually by the *Marine Review*, of Cleveland, a statistical publication and also a directory well known in shipping and shipbuilding circles throughout the country, contains as an introduction a careful review of conditions prevailing in these lines, from which the following is taken:

Not a single contract has been let for a vessel for the foreign trade of the United States during the past two years. Except on the great lakes, where the industry is peculiarly a special one protected by the coasting regulations, there is little encouraging to report regarding shipbuilding in the United States. Orders have become like the proverbial visits of the angels—few and far between. During the fiscal year ended June 30, last, 1,536 vessels of 456,076 gross tons were built in the United States, compared with 1,657 vessels of 473,981 gross tons for the previous fiscal year. Vessels now under construction indicate a further lessened output for the coming fiscal year. The principal decrease for the past year has been in steel steamers built on the great lakes, which number forty-one of 131,660 tons, compared with fifty-two of 161,797 tons for the preceding year. The previous year was the one of greatest output in the lake district. On the seaboard eighteen ocean steel steamers of 101,471 gross tons were built—the largest output of this type in our history. Think of it. Eighteen ocean steel steamers in this continent—covering a country with 70,000,000 of souls. Nor were these all for oversea trade. Far from it. Only five of them can properly be credited to that service.

A few contracts have been received by the coast ship yards for some splendid vessels for the coastwise service. Since the Spanish-American war naval contracts have been well distributed among the coast shipbuilders. During the year contracts for four battleships, two armored cruisers and two gunboats have been given to them. Contracts for two more battleships are about to be given, and in addition the New York navy yard is building one battleship. Forty-one warships are at present under construction, representing a displacement of 338,948 tons, a total horsepower of 415,500, and costing for hulls and machinery $90,314,516.

A foreview of shipbuilding on the great lakes does not show many orders in abeyance. A year ago the ship yards were filled up with orders for a full year ahead. But that is not the case now. The lake ship yards, broadly speaking, are now well up with their work. If they had to do so they could probably turn out all orders on hand within six months. Those best informed, however, do not take a dubious view of things on the great lakes. The industry, as stated before, is special; the ships are not like other ships; the shipping is not like other shipping; it is not made up of a multiplicity of things as is ocean carriage, but is confined to a few items in bulk; these items are likely to continue to be moved for years in a constantly ascending scale and ships will continue to be built to carry them. Moreover, a fair part of existing tonnage on the lakes is wooden; it is old and decaying and must go the way of all craft; and it must be replaced by new and more modern carriers. Thus shipbuilding on the lakes for many years is assured, although the number of orders for the coming year will fall considerably short of the business of any of the past three years.

The Eastern Machinery Market.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 4.

The machinery market in this vicinity for July was in a much more satisfactory condition than could be said of June. Not only was the supply of orders more abundant, but the feeling which prevailed was of a more hopeful kind. Those who a month or six weeks ago thought that the market was shaping itself for a good sized falling off in trade, said the developments during July were of such a satisfactory character that they felt their original views were too pessimistic, and that subsequent events proved them to be so.

The month was chiefly notable for the conclusive evidence it gave of a busy fall and winter season, and for which the financial situation stood sponsor. This was brought about by inquiries sent by machinery merchants to interests known to be in the market for machinery, but who were said to have decided to curtail the purchases they originally intended to make, because of their inability to secure the necessary capital. This was particularly true of railroad orders, adverse information concerning which had been frequently circulated. Machine tool men who made inquiries report that the railroads have not changed their plans one iota, and this was shown later on when specifications calling for a good round lot of tools came from the Erie and Lehigh Valley railroads, followed by some purchases in which the Niles-Bement-Pond Co., Manning, Maxwell & Moore, and the Prentiss Tool & Supply Co., among others, figured.

The machine tool situation during the month, outside of what has been stated, was without particular feature. Miscellaneous business was excellent, and it generally comprised one or two tools at a time. The "street" expected several large propositions to materialize, but they didn't. One of these was the equipment for the new shops of the Ingersoll-Sergeant Drill Co., at Phillippsburgh, N. J., but the company will probably purchase one or several tools at a time, instead of the whole equipment at once, which has been the way many large lists have turned out during the past six months. The trade is waiting to hear from the General Electric Co., which, strange to relate, has not been a purchaser of machine tools for the past four months. The new buildings of the company at Schenectady, N. Y., and at Lynn, Mass., are fast approaching completion, and machine tool men expect to be called upon any day to pass upon the specifications that are now being prepared for them. There is nothing to say about the equipment for the new shops of Henry R. Worthington at Harrison, N. J., the specifications for which have been expected since January. Another large machine tool order hung up is that of the Loomis-Pettibone Co., concerning which we referred at length in our June review. The company is still undecided whether it will erect a new plant or purchase an old one. In lathe attachments of all kinds prices were advanced about 5 percent recently, but in machine tools proper prices are being well maintained.

The engine and boiler trades, while they showed an improvement over June, are not in as healthy condition as they might be. Everywhere one hears of reports of orders held up, with the prospects of their being given out in the near future not of the best. From many centers where new construction is being contemplated or projected, an unwillingness to close contracts has asserted itself. Several examples are cited below, but the list could easily be multiplied. Engine and boiler men always expect some delay to take place in closing trades in their line, but all say that there never was so much of it in evidence as recently. Then there are some of them who declare that they never knew so little business to be in prospect as now, and they explain it by stating that the labor situation has become a constant menace to new enterprises, and that those promoting them are unwilling to go ahead while labor insists on resorting to arbitrary methods. Wall Street developments have had a depressing influence also. Prices are said to be a little easier, caused by the keen competition in connection with such orders as are going.

Electrical machinery manufacturers say trade with them is pretty fair. By way of comparison with June, July in the opinion of some was a little better month, but the majority of reports are to the effect that it was only as good at best, while some houses say they were not as busy. One large manufacturer in commenting upon prices said they were inclined to be a little easier.

In machinists' supplies varying reports are heard, but in the main it would seem as if trade was normal. Store business is good. Machine shops with specialties are all busy. In machine circles the impression is that foundries are doing a rushing business. One engine manufacturer in stating the reason for his belief, told how castings weighing 23,000 pounds were recently received at his shop, and he was compelled to return some of them, aggregating 16,000 pounds, because they were defective. He also said that he had 16 engines on the floor at his shop waiting for cylinders. He believed both incidents showed that foundries had more business than they could properly handle, and thought that the defects in the making of castings, and the delay in getting them, confirmed him in his belief. He also told of how a stove maker, who is a friend, ordered moulding machine castings to the extent of 8,000 pounds, and had to send over half of them back because they were bad.

The export machinery trade is without particular interest, and any activity is confined to electrical equipment and agricultural implements. The General Electric Co. has the giving out of an order for a 4,000-horsepower engine for installation in New South Wales, but the contract has not yet been awarded.

Paul Bigelow, the local representative of the Buckeye Engine Co., of Salem, O., at 39 Cortlandt St., made the following sales during July: One 650-horsepower cross compound engine, to the American Steel & Wire Co., Allentown, Pa.; one 400-horsepower cross compound engine, to the Passaic Steel Co., Paterson, N. J.; and one 200-horsepower engine to the Steinway Piano Manufactory, Astoria, L. I. Mr. Bigelow has found a hesitancy on the part of industrial enterprises being formed to give orders. He had contracts practically closed for engines for new copper wire and carpet plants, as well as three paper mills, but the parties decided to wait until the labor and financial situations cleared. He believes engine builders can view the outlook with perfect satisfaction, as prospects in their line are very bright.

James Beggs & Co., manufacturers of machinery, tools, and supplies, at 9 Dey St., took possession of their new building at 109 Liberty St. a few days ago. It is one of the largest and best appointed structures in the machinery district, and is four stories.

The Lidgerwood Mfg. Co., manufacturer of hoisting engines at 96 Liberty St., is making great headway with the new $2,000,000 plant it intends to build at Newark, N. J. Specifications for the building of the foundry and power house were sent to contractors about ten days ago, and bids are returnable Aug. 15. When the contracts are given out, the company will solicit bids for the equipment of the buildings at once, as it is anxious to have them in operation by the end of the present year. The company's current trade is of large proportions, and it has on its books orders for nearly 400 engines which it has not touched.

The Crocker-Wheeler Co., manufacturer of electrical equipment, at 39 Cortlandt St., says that its business for the first six months of this year is nearly three times as great as that for a similar period last year. It reports a fair trade nowadays, with a slowness in giving orders where new construction is involved. It had a contract signed with a new packing plant for generators aggregating about 1,600 kilowatts, but was asked to cancel it for the time being anyway, and did so.

W. B. Mayo, the local manager of the Hooven, Owens, Rentschler Co., at 39 Cortlandt St., representing the Hamilton-Corliss engines, has just returned from a lengthy trip through the West and the South. He found evidences of

good business everywhere among engine builders, but all noticed that trade in New York and New England since the labor and financial world became so seriously disturbed, had fallen off greatly.

E. S. Boyer, representing the American Engine Co., at 95 Liberty St., recently received the following orders: Three 120 and one 160-horsepower duplex, compound belted engines, from the Atlantic Dynamite Co., Wilmington, Del., and one 75-kilowatt unit direct connected duplex engine, from the Airl Printing Co., Philadelphia. He has two contracts aggregating about $30,000 almost closed. Mr. Boyer says his company has not taken an order in New York City since May, or in other words since the great strike in the building trades began. In many lines a like experience could be cited.

It is announced that the plant and equipment of the Mossberg & Granville Mfg. Co., at Providence, R. I., will be sold this week, perhaps tomorrow. The company manufactured presses, drops, swaging machines, wire machinery, and roller bearings. Not long ago it embarked in the manufacture of a typewriter on a large scale, but its sale was not up to expectations, and is said to have seriously crippled its capital, which was supplied by Wall Street men.

SURFACE SPEEDS FOR MILLING CUTTERS.

BY FRANK B. KLEINHANS, M. E.

Milling cutters are invariably run either too slow or too fast. It is not an uncommon thing to find a tee slot cutter running much too slow, while the next machine will have a face milling cutter of large diameter running too fast. In order that any man in the milling department may be able to run his milling cutter at the proper speed, the Lodge & Shipley Machine Tool Co., of Cincinnati, has prepared the table reproduced herewith.

This table gives the revolutions per minute of various cutter diameters. In order to give a cutting speed of 20 feet per minute for steel, 40 feet per minute for cast iron and 60 feet per minute for brass, the revolutions given are readily checked by counting the number of turns of the cutter.

The table will be found to save considerable time in the milling department as by increasing the speed we also increase the feed in the same proportion and therefore the job is finished in so much less time.

TABLE OF SURFACE SPEEDS FOR DIFFERENT SIZES OF MILLING CUTTERS.

Cutter Diam.	Rev. Per Minute			Cutter Diam.	Rev. Per Minute			Cutter Diam.	Rev. Per Minute			Cutter Diam.	Rev. Per Minute		
	Steel	Cast Iron	Brass		Steel	Cast Iron	Brass		Steel	Cast Iron	Brass		Steel	Cast Iron	Brass
¼	306	611	918	⅛	24	48	73	¾	11½	23	34	⅜	7½	15	22
5/16	244	488	732	¼	23	46	70	⅞	11	22	33	½	7½	14½	22
⅜	204	408	612	⅜	22	44	68	7	11	22	33	⅝	7	14½	22
7/16	174	348	522	½	21	42	65	⅛	10½	21	33	¾	7	14	21
½	153	306	459	⅝	21	42	63	¼	10½	21	32	⅞	7	14	21
9/16	136	272	408	¾	20	40	61	⅜	10½	21	31	11	7	14	21
⅝	122	244	366	⅞	20	40	59	½	10	20	31	⅛	7	14	21
11/16	111	222	333	4	19	38	57	⅝	10	20	30	¼	7	14	20
¾	102	204	306	⅛	19	38	56	¾	10	20	30	⅜	6½	13	20
13/16	93	186	279	¼	18	36	54	⅞	9½	19	29	½	6½	13	20
7/8	87	174	261	⅜	18	36	52	8	9½	19	29	⅝	6½	13	20
15/16	81	162	243	½	17	34	51	⅛	9½	19	28	¾	6½	13	19½
1	76	152	228	⅝	17	34	50	¼	9½	18½	28	⅞	6½	13	19
1⅛	68	136	204	¾	16	32	48	⅜	9	18	27	12	6½	13	19
1¼	61	122	183	⅞	16	32	47	½	9	18	27	⅛	6½	13	19
1⅜	55	110	165	5	15	30	45	⅝	9	18	26	¼	6	12½	19
1½	51	102	153	⅛	15	30	46	¾	8½	17½	26	⅜	6	12½	18½
1⅝	46	92	138	¼	14½	29	44	⅞	8½	17	26	½	6	12	18
1¾	43	86	129	⅜	14	28	43	9	8½	17	25	⅝	6	12	18
1⅞	40	80	120	½	14	28	42	⅛	8½	17	25	¾	6	12	18
2	38	76	114	⅝	13½	27	41	¼	8½	16½	25	⅞	6	12	18
2⅛	36	72	108	¾	13½	27	40	⅜	8	16½	24	13	6	11½	18
2¼	34	68	102	⅞	13	26	39	½	8	16	24	⅛	6	11½	17
2⅜	32	64	96	6	12½	25	38	⅝	8	16	24	¼	6	11½	17
2½	30	60	92	⅛	12½	25	38	¾	8	15½	23½	⅜	5½	11	17
2⅝	29	58	87	¼	12	24	37	⅞	7½	15½	23	½	5½	11	17
2¾	27	54	83	⅜	12	24	36	10	7½	15	23	⅝	5½	11	17
2⅞	26	52	79	½	11½	23	35	⅛	7½	15	23	¾	5½	11	17
3	25	50	76	⅝	11½	23	34	¼	7½	15	22	⅞	5½	11	16½

F. R. Peacock will build a one-story brick brass foundry 120x60 feet at Norton, Pa.

STEAM-DRIVEN AND GAS-DRIVEN BLOWING ENGINES.*

BY TOM WESTGRATH.

It is, perhaps, not necessary to discuss the older types of steam blowing engines, except to remark that they must have been very suitable for the work to be done, judging from the few changes that have been made, and the long time they have worked. But the steam blowing engines which have done such good work were found a few years ago to be unsuitable for the harder work and higher blast pressures required, the development first taking place in the United States, where ironmasters had a great advantage in being able to put down entirely new plants, and therefore could adopt the experience of other countries. These developments followed in Europe, commencing about ten to fifteen years ago, when some of the more progressive ironmasters began to put down engines of much heavier design, having compound steam cylinders and capable of running faster and blowing at higher pressure, the type of engine used being, I think, fairly illustrated by engines built by my firm—that is, twin vertical engines having compound steam cylinders, 40 in. and 84 in. in diameter by 60 in. stroke, exhausting into a separate condenser, the boiler pressure being 150 lb. per square inch. As the engines had to run in ordinary work at 50 revolutions a minute, and to blow up to 30 lb. per square inch, it was decided to equip the air-cylinders, which are 84 in. in diameter and 60 in. stroke, with the sliding-valves made by the Southwark Foundry & Machine Co., of Philadelphia. These valves proved to be a great success, as the clearance is reduced to 1½ percent; the inlet-valves are worked by mechanical gear from the shaft, and the outlet valves are closed mechanically, but are reopened automatically by the air pressure, the arrangement being such that, when the pressure in the cylinder and in the mains is balanced, the valves are slightly lifted from the face, and are pushed open by a controlling cylinder actuated by the air pressure, so that the arrangement is not only automatic, but practically frictionless.

I understand that a set of triple-expansion vertical blowing engines with three cranks has been working for some time in West Cumberland, with satisfactory results; but, as I have not seen the engines, I am not able to do more than refer to them.

The next step which I took in the construction of steam

*Read at the Engineering Conference of the Institution of Civil Engineers, June 17, 1903.

blowing engines was to adopt the so-called quarter-crank arrangement, which was developed by the Southwark Foundry & Machine Co., of Philadelphia. With the increasing piston speeds, and particularly the increasing blast pressures, to be dealt with, it became evident that some alteration would have to be made in the ordinary design of steam blowing engines. With the usual plan of having the steam and air cylinders in line and working upon the same rod, it is found that serious shocks occur at each end of the stroke when using high pressure steam and blowing against high pressures, because whilst the steam pressure must be admitted into the cylinder at a very early part of the stroke, the full resistance does not accumulate in the air cylinder until a much later part of the stroke. Although this difficulty exists in a smaller degree in all ordinary blowing engines, it was not found to be serious with low speeds and low pressures, but it was found to result in frequent accidents when modern requirements were being fulfilled, and the quarter-crank engine was therefore designed to overcome the difficulties. The arrangement consists of an ordinary inverted vertical steam engine acting upon a crankshaft and flywheel. Upon the opposite end of the crankshaft from the flywheel is fitted another crank, which, by means of the usual gear, works an inverted vertical blowing cylinder placed side by side with the steam cylinder. It will be understood that the cranks can be placed at such an angle that the shocks referred to can be avoided, and that this type of engine can therefore be run at much higher speeds, blowing at high pressure with perfect smoothness and safety; indeed, these engines can be run so much faster that, although at first sight expensive, they are not much more costly than an ordinary vertical engine when the quantity of air discharged is considered. It will also be observed that the high-pressure and low-pressure sides of these engines are quite separate, being connected only by the exhaust from the high-pressure to the low-pressure cylinder, which passes through a reheater, so that if either half of the engine is laid off for repairs or by accident, the other half can be kept going. The engines are fitted with the sliding-valves already referred to. These quarter-crank engines have been largely adopted in America and in England. My firm has a number of sets in hand, and we hope to be ready to show a set in work at Barrow when the Iron and Steel Institute meets there in September.

It recently became evident that blowing engines worked with gas are particularly suitable for blast furnace work. I therefore investigated the matter fully and carefully, and finally made arrangements with the Societe Anonyme John Cockerill, of Seraing, to build gas-driven blowing engines to their designs and under their patents, and I shall speak more particularly of the Cockerill engine as being the one I understand best. No doubt others will be able to give us information as to the Körting, Oechelhäuser, Crossley, Premier, and other gas blowing engines, the object of this paper being to invite discussion on these matters.

The Cockerill Co. was the pioneer in the making and using of large-size blowing engines to work with blast furnace gas. The engines work upon the Otto cycle, and for blowing work have usually one single-acting cylinder. We are now developing the same arrangement, but with double-acting gas cylinders, for blowing-work, but more particularly for dynamo-work, which does not come within the scope of this paper.

The air-cylinder of such an engine is fitted with a large number of small circular valves. These have proved to give very good results at speeds up to 80 and 90 revolutions per minute, but I am now building two of these engines fitted with the Southwark sliding-valves, from which I expect still better results, as I think the sliding-valve mechanically controlled will prove to be more suitable for the high speeds at which gas engines must run to be economical. The engine has a single-acting gas cylinder 51½ in. in diameter by 55 in. stroke, a blowing-cylinder 72 in. in diameter by 55 in. stroke, and is to work at 80 revolutions per minute.

Having now spoken of gas and steam blowing engines individually, we will pass on to what is at present the most important and most interesting part of the question—viz., as to whether steam-driven or gas-driven blowing engines are more economical and more suitable for the work to be done, and I have no hesitation in saying that, speaking generally, in my opinion the gas engine is more suitable, providing always there is a ready means of using the gas which will be saved by using the gas engine. If an entirely new steel works with blast furnaces, etc., is to be put down, undoubtedly the whole of the blowing power for the furnaces should be derived from gas; and if the gas be cleaned, as it should be for the stoves, it will be found that there is a considerable surplus, which can be sent to the steel works' boilers or used for gas engines to generate electricity; but if a blast furnace plant is to be erected without steel or other works, and there are no other outlets for surplus power, there is probably not much difference between using steam-driven or gas-driven blowing engines; but in these days of universal application of electricity, it is very unlikely that a blast furnace plant would be erected where surplus power could not profitably be used. I think the question between steam-driven and gas-driven blowing engines is more open for consideration where existing works, requiring increased blowing power, have to be dealt with, and then it would turn largely upon a question of existing boilers, condensers, etc.; if these are ample and are in good condition, and there is no easily found means of using surplus power, many people would prefer to put down steam blowing engines; but if a condenser and new boilers have to be put down, it would appear to be wiser, instead of using steam blowing engines, to adopt gas-driven engines. To consider the whole question, it may safely be assumed that the quantity of gas used by gas-driven engines would be about one-fourth that required to raise steam in good boilers for steam-driven blowing engines. It may also be considered that, broadly, the cost of a steam-driven blowing engine of modern construction—say, a compound or triple-expansion engine with Corliss valves and mechanically controlled air valves, together with the necessary boilers, condensing plant, etc.—will be somewhat more than that of gas-driven blowing engines, with the necessary gas-cleaning plant, for a given amount of work to be done. It may also be assumed that the consumption of oil for a gas engine will be slightly greater than for a slower-running steam engine, although not much, this matter of oil consumption having been greatly exaggerated; and also that the consumption of water for a gas engine will be less than for a steam engine.

The controversy between the Great Northern Railroad and its machinists has been settled. The new schedule provides that the men working on the eastern division of the road—that is east of Minot, N. D.—shall receive 34½ cents an hour, and west of Minot they shall receive 37 1-2 cents an hour. The controversy with the boiler makers of the road is still pending.

The plant of the Carnegie Steel Co., Sharon, Pa., formerly operated by the National Steel Co., has been shut down for extensive repairs. All departments are down and it is probable that operations will not be resumed until September. The South Sharon works, formerly operated by the Sharon Steel Co., are in full operation.

The Cuyahoga Wire & Nail Co., Cuyahoga Falls, O., is going out of the business on coarse wire products, such as nails, fence wire, etc., and will hereafter confine itself to specialties.

The Haldeman-Crossley Machine Co., recently incorporated, has purchased a plant at Defiance, O., and will commence manufacturing in from 60 to 90 days. It will manufacture a line of feed cutters, ensilage cutters, blacksmith tools, butchers' supplies, band saws and small tools generally.

The J. H. Gillon Machine Co., Waycross, Ga., has moved into its new foundry, and the first cast was taken off a few days ago. The new foundry is about four times as large as the old one.

CARD SYSTEM FOR SHOP KEYS.

One of the many little problems confronting the shop manager is to properly control egress and ingress for the various departments, the maintenance of security in regard to lockers, closets, stores, etc., and due record of those charged with the responsibility. The system here given has been adopted in the plant of the New Britain Machine Co., at New Britain, Conn., for the purpose of recording all keys and indexing them by their use as well as by those charged with their care.

A simple form of card has been found suitable for both purposes. When used as a description of the key, the card gives on the one side the key number, what it fits and the lock number together with the dates the keys have been put into service

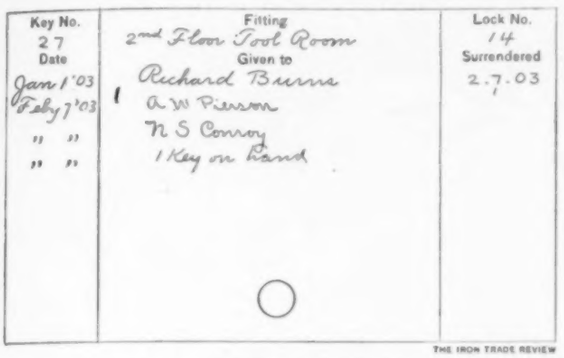

FIG. 1.—RECORD OF SHOP KEYS.

and the signatures of persons holding and receiving them.

Fig. 1 shows the obverse of such a card as has been described and it will be noted that three keys, No. 27, were made to fit lock No. 14 of the second floor tool room, that two keys are now out and that one is still in hand, that the first workman surrendered his key on Feb. 7, 1903, when he left the employment of the company. On the reverse side of the card is a penciled outline showing what the key looks like, who made it and the maker's number, etc., in order that duplicates may be readily ordered. The reverse side of the card is illustrated in Fig. 2.

These card records of the shop keys are filed numerically according to the key numbers. A second card is filled out for every key holder as illustrated in Fig. 3 and these are filed alphabetically according to name of workman. The card shown

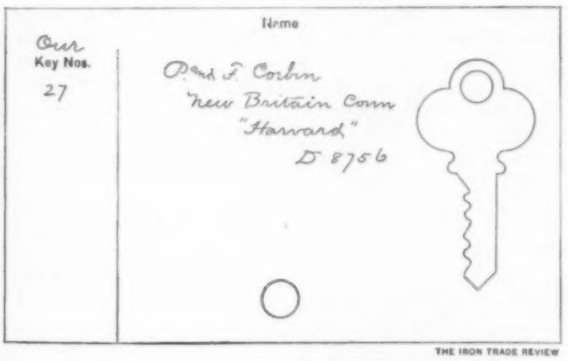

FIG. 2.—BACK OF CARD ILLUSTRATED IN FIG. 1.

in Fig. 3 exhibits under each workman's name the keys that are charged to him and in this way they show exactly what every key holder has access to in the factory and what he must return when leaving the employment of the company. The general scheme is a simple one and affords a flexible record for meeting and controlling a rather complicated situation. The choice of a proper man to hold responsible positions is little, if any, more important than a clear record of his responsibilities, and keys, important as they are in reality, frequently fail of systematic control, though it is manifest that holders ought to be strictly held to account. Such a method is given in the above article and is found very satisfactory in practice.

NEW BOOKS.

"COMPOUND CORLISS ENGINES."—The author intended the present volume as the second edition of his book on compound engines but the revision has been so thorough and the added material large enough to warrant a new title for the virtually fresh start. The variable cutoff features characteristic of the Corliss engine are assumed in all the examples and this accounts for the inclusion of the name of the Providence pioneer in the title of the treatise. The treatise is, in fact, a text book on the generation and utilization of heat as well as the transformation of heat energy into mechanical energy by means of the multi-cylinder Corliss steam engine. The work is eminently practical, the author has employed the fruits of his twenty years' experience in simplifying the subject and has stripped the technicalities from his method to meet the needs of students with but a sparse mathematical equipment. The examples are based upon current practice and the data taken from engines actually built and running. The rules are plainly stated and in the attempt to keep the calculations well within the range of a common school arithmetic, the use of algebra is almost entirely discarded. Not the least interesting portions of the work are occasional hints in regard to mistaken and hasty conclusions by the unwary, notes of experience relative to practical economy and first cost and other matters of value to the prospective purchaser as well as the student of steam plant equipment. There are numerous diagrams, rules and tables, an extended list of contents by chapters and a

FIG. 3.—CARD INDEX TO KEY HOLDERS.

good index. The book is bound in flexible black leather, round corners and gilt edges, and has 180, 7½ x 4½-inch, pages. Published by the author, James Tribe, Milwaukee, Wis. Price, $2.50.

"THE ART OF PATTERN-MAKING."—The books treating of this subject are few compared with the number dealing with the allied crafts and the present work is a welcome addition. Pattern-making literature is by no means so extensive as the importance of the trade would warrant. At least there are few books bearing exclusively upon the making of patterns, though many excellent articles dealing with various details have from time to time appeared in the technical press. The author, I. McKim Chase, himself a frequent contributor, has gathered these scattered articles with discrimination and made good use of them. His treatment is suggestive of the shop on every page and his comments on the management of pattern makers, shop equipment and methods, are tinctured with working knowledge. A book of 260 5 x 7½-inch pages does not indicate "a comprehensive treatise" but within the manifest limitations much has been accomplished. The chapters on the storage, marking and recording of patterns, the making of patterns with branches, pattern work for screw propellers, are especially noteworthy. The book contains 215 illustrations and is published by John Wiley & Sons, New York. Price, $2.50. Cloth.

The W. H. Mason Steel Champion Fence Co., Leesburg, O., desires to change its location, and is asking different cities what inducement they will offer.

July was the banner month in the history of the blast furnace of the Struthers Furnace Co., at Struthers, O., for amount of product, which was 9,676 tons.

Shop and Sales Systems of the C. W. Hunt Co.

BY JOHN CALDER.*

For bookkeeping and economic purposes the incorporated C. W. Hunt Co. is worked as two independent concerns, accommodated, however, in one office building. The parent and proprietory concern—C. W. Hunt Co.—conducts all negotiations with customers, manages sales and publication departments, compiles estimates and skeleton drawings of schemes, and supplies, direct from its warehouse, all orders for standard stock machinery. Its general functions are graphically shown above the line on system chart No. 1 (general), and in detail on charts No. 2 (sales) and No. 3 (preliminary engineering and estimating.) The "case" referred to on the

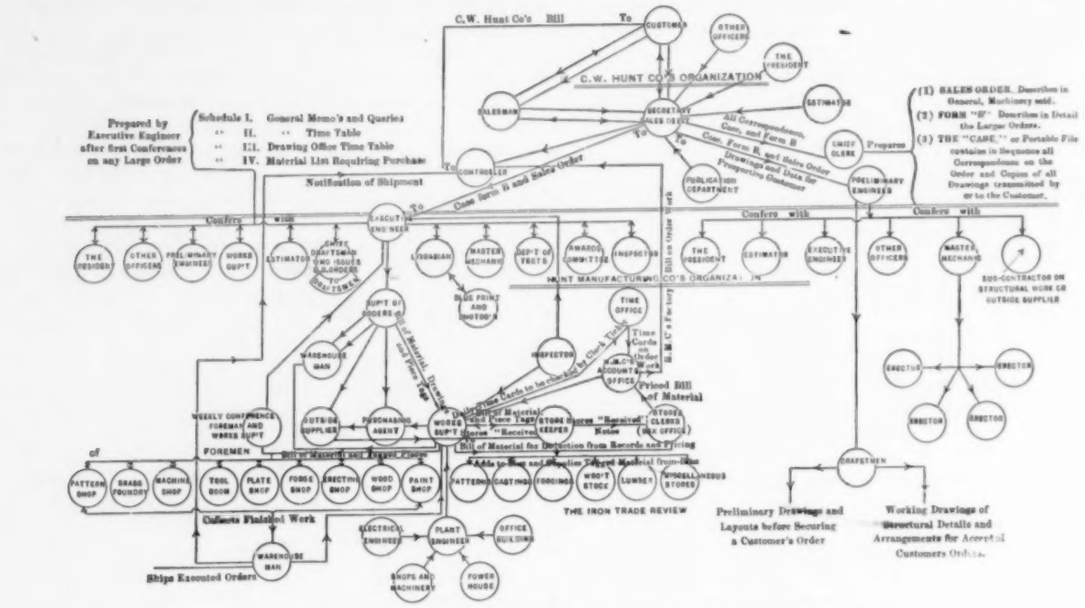
C.W. Hunt Co's Bill To CUSTOMER
C.W. HUNT CO'S ORGANIZATION
Prepared by Executive Engineer after first Conference on any Large Order
Schedule I. General Memo's and Queries
" II. " Time Table
" III. Drawing Office Time Table
" IV. Material List Requiring Purchase
Notification of Shipment
Confers with
Confers with
Confers with
HUNT MANUFACTURING CO'S ORGANIZATION
Bill of Material, Drawings and Piece Tags
Bill of Material for Detention from Records and Pricing
Collects Finished Work
Ships Executed Orders
THE IRON TRADE REVIEW
Preliminary Drawings and Layouts before Securing a Customer's Order
Working Drawings of Structural Details and Arrangements for Acceptal Customers Orders.

FIG. 1.—GENERAL CHART OF SYSTEM AND ORGANIZATION.

FIG. 2.—CHART OF SALES DEPARTMENT.

charts is a portable file containing the original of every letter or plan received, concerning an order or inquiry, and a copy of every letter, estimate or plan dispatched. These are added at each mail hour and the "case" can always be had on loan from the chief clerk. The latter refers the case, after every mail, to the party or department interested in a communication received, and it is returned initialed and dated to indicate that the matter has been dealt with. This system saves the writing of a great many inter-departmental communications.

The subsidiary and domestic Hunt Manufacturing Co. is as separately conducted as if it were an outside concern, and is used purely for productive work. The manager of the latter, and connecting link between it and the parent company, is the executive engineer, to whom all sales and technical inquiries are immediately referred.

If the sale is for stock articles, the factory departments are not involved, and an order to ship, on the C. W. Hunt Co.'s warehouseman, who reports direct to the executive engineer, is all the formality required.

If the work requires manufacturing, is on a large scale, and of complex character, the order of execution is as per chart No. 4 (executive engineer's).

If, on the other hand, it is of routine character, it proceeds without delay direct to the shops from the order department, as per chart No. 5. Bills of material, forms D-1 and D-2, Figs. 6 and 7, and piece tags, form F, Fig. 8, for writing to each lot of similar articles, accompany the shop drawings. The latter are merely scale pictures of related parts 11½ inches by 18 inches, with nothing on them but the necessary machinist's dimensions, the limits for same, and the routing to be followed. The cutting-off machines are in the stores, and the stock and castings are supplied as per the bill of material, tagged and placed in trays ready at call from foremen.

It should be noted that the contracts usually include a definite date by which all the machinery and structures must be erected, and in working condition. This erection may be in Canada, United States, United Kingdom, Mexico or Philippines, for instance, and it is necessary to work back from that date through all the estimated time for field work, transportation and shop requirements, to the time left for office work, drafting and purchasing.

As there are never large quantities of similar parts requiring to be manufactured on any one order, a daily graphic analysis is not attempted. It is found that the weekly meeting of the heads of producing departments, at which are considered the time schedules for

C-1 Preliminary analysis, Fig. 9.
C-2 Factory work, Fig. 10.
C-3 Drafting, Fig. 11.
C-4 Purchasing requirements, Fig. 12.

are sufficient for the purpose. At this meeting also the bills of material for ordinary production work are considered seriatim, and a comprehensive idea is presented to all concerned, of the progress of stock manufacture and sales orders in comparison with the dates already fixed for each stage of production.

This manufacturing to time schedules on individual orders of special combinations of machinery is quite separate and

*Mr. Calder is the executive engineer of the C. W. Hunt Co. The illustrations accompanying the article represent a system of analyzing and time-tabling a complicated order; also give graphic representations of the relations and functions of engineering, sales and manufacturing departments.

distinct from the manufacture for the C. W. Hunt Co.'s warehouse stock of standard parts. The latter are drawn off as required by them, without reference to the Hunt Manufacturing Co., who bill all goods to the C. W. Hunt Co. at cost price, and are credited with work done on same. See Fig. 13, graphic chart No. 6, for analysis of cost price at which goods are billed to the parent company.

The bills of material, forms D-1 and D-2, Figs. 6 and 7, with weights of material used, and cost of same, and accompanied

2. No material may be operated upon unless a bill of material exists and accompanying piece card is wired to the piece.

3. The draftsman will fill up in copying ink columns 1 to 13 inclusive, and hand to chief draftsman drawings and bills.

4. The executive engineer will O. K. the same and transmit to order department.

5. The order department will then deal with the bill of material as prescribed by system chart No. 4.

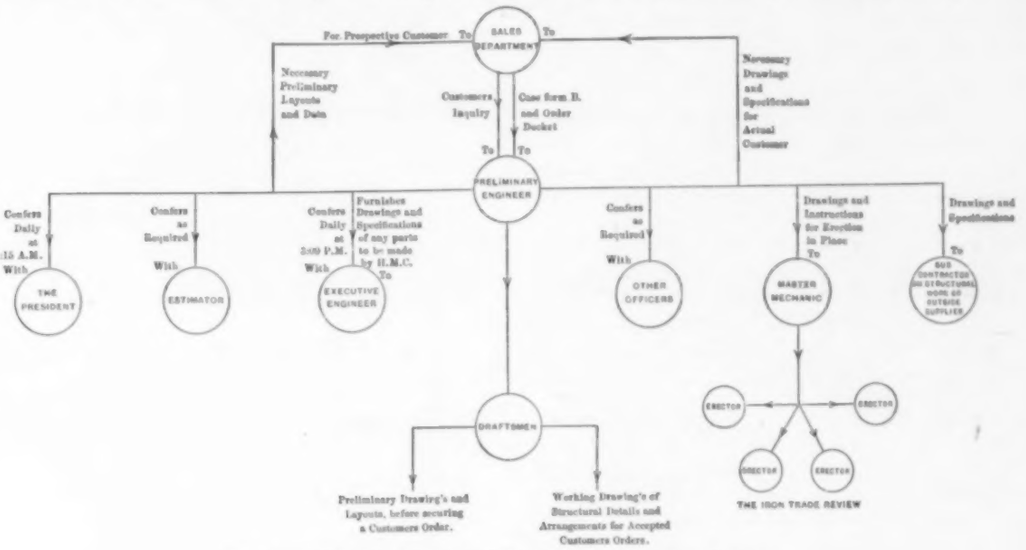

FIG. 3.—PRELIMINARY ENGINEERING AND ESTIMATING CHART.

by the time cards, form E, Fig. 14, "day," "bonus" and "piece" of different colors, pass into the costing department, and the cost of manufacture, allowing for all fixed and variable charges, but no profit, is recorded there expeditiously, and at once compared with previous records, both as to time and expense. Discrepancies, excessive labor or cost are referred at once to the weekly conference held on Monday nights after working hours, and the matter quickly sifted out, and responsibility placed in the right quarter.

Figs. 6 and 7 have along the upper edge a list and index to the shop department numbers, as well as detailed instructions for using the forms, D-1 and D-2. These were omitted from

Making out piece tags and (5) copies, (1) for record and (4) to works superintendent, who will deal with same as prescribed by system chart No. 5.

6. The (4) copies will be transmitted to the works superintendent, along with drawings and piece tags, and he will deal with same as prescribed by system chart No. 5, (1) copy for record, (1) to the foremen, (1) to the stores, (1) to H. M. C.'s office.

The time cards arranged daily by workman No. — are checked by the clock cards, posted weekly on pay cards, form K-2, and re-shuffled by job No. — in the cost department, where they are daily entered with other costs on form K-1,

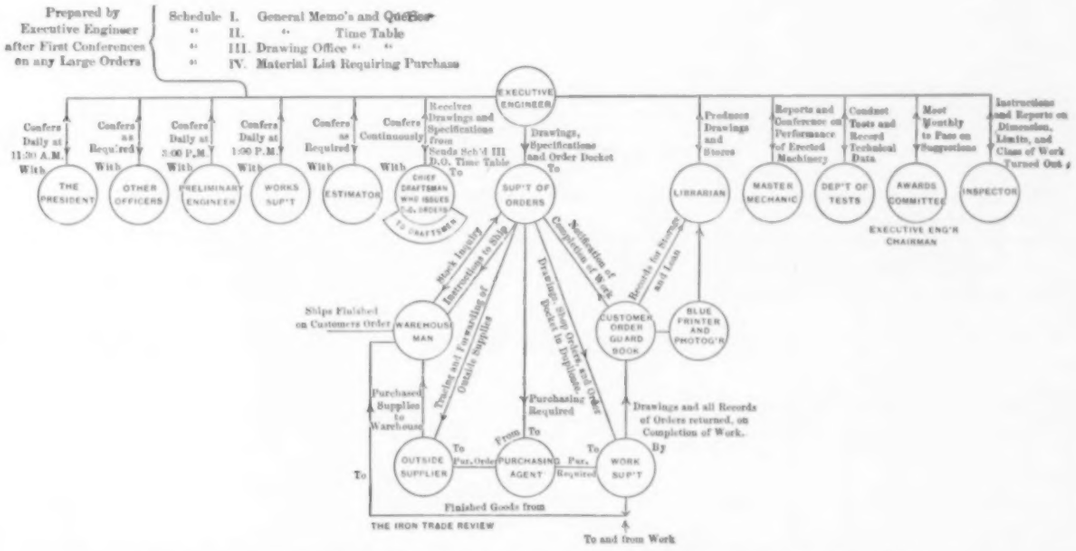
Prepared by Executive Engineer after First Conferences on any Large Orders
Schedule I. General Memo's and Quotes
" II. " Time Table
" III. Drawing Office " "
" IV. Material List Requiring Purchase
EXECUTIVE ENGINEER
Confers Daily at 11:30 A.M. With
THE PRESIDENT
Confers as Requ'red With
OTHER OFFICERS
Confers Daily at 3:00 P.M. With
PRELIMINARY ENGINEER
Confers Daily at 1:00 P.M. With
WORKS SUP'T
Confers as Required With
ESTIMATOR
Confers Continuously With
CHIEF DRAFTSMAN WHO ISSUES C. O. ORDERS
To DRAFTERS
Receives Drawings and Specifications from Friends Sch'd III D.O. Time Table To
SUP'T OF ORDERS
Drawings, Specifications and Order Docket To
Produces Drawings and Stores
LIBRARIAN
Reports and Conference on Performance of Erected Machinery
MASTER MECHANIC
Conduct Tests and Record Technical Data
DEP'T OF TESTS
Meet Weekly to Pass on Suggestions
AWARDS COMMITTEE
EXECUTIVE ENG'R CHAIRMAN
Instructions and Reports on Dimension, Limits, and Class of Work Turned Out
INSPECTOR
Work Inquiry
Instructions to Ship
Notification of Completion of Work
Records for Storage and Loan
Ships Finished on Customers Order
WAREHOUSEMAN
Tracks and Forwarding of Outside Supplies
Drawings, Shop Orders and Order Docket in Duplicate
CUSTOMER ORDER GUARD BOOK
BLUE PRINTER AND PHOTOG'R
Purchased Supplies to Warehouse
Purchasing Required
Drawings and all Records of Orders returned, on Completion of Work.
To
From
To
To
To
OUTSIDE SUPPLIER
Pur. Order
PURCHASING AGENT
Pur. Required
WORK SUP'T
By
Finished Goods from
To and from Work
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FIG. 4.—CHART SHOWING RELATION OF EXECUTIVE ENGINEER TO OTHER DEPARTMENTS.

the engravings, as, on account of the reduction in size required, the lettering would have been indistinct. The instructions are reproduced, and with one exception are identical for both forms. The draftsman is required, in Fig. 7, to fill in columns 1 to 10 only.

INSTRUCTIONS FOR USING THE FORM.

1. No material may be supplied from store or purchased unless first authorized by a bill of material.

Fig. 15, and give a daily, weekly and also final balance of the factory cost of any given shop order. Such shop orders are issued for related details, and are easily combined for total cost.

(The pay sheet, form K-2, is not reproduced. It contains columns at the left for the workman's number and name and these are followed by a series of columns for each day of the week, the total time, rate, amount and remarks. These

are reproduced across the page and the sheet is large enough to record the time of sixty men for the four weeks.)

A daily graphical balance of factory departmental expenditures is available every forenoon for the previous day's work, and a weekly summary, form K-3, follows. The working of

All workmen of the Hunt Manufacturing Co., draftsmen, etc., turn in a daily time card, Form E, Fig. 14, ("Day," "Bonus," or "Piece," of different colors made up in pads of 50 each) for each shop order on which they have been engaged. Draftsmen have a series of fixed charge numbers

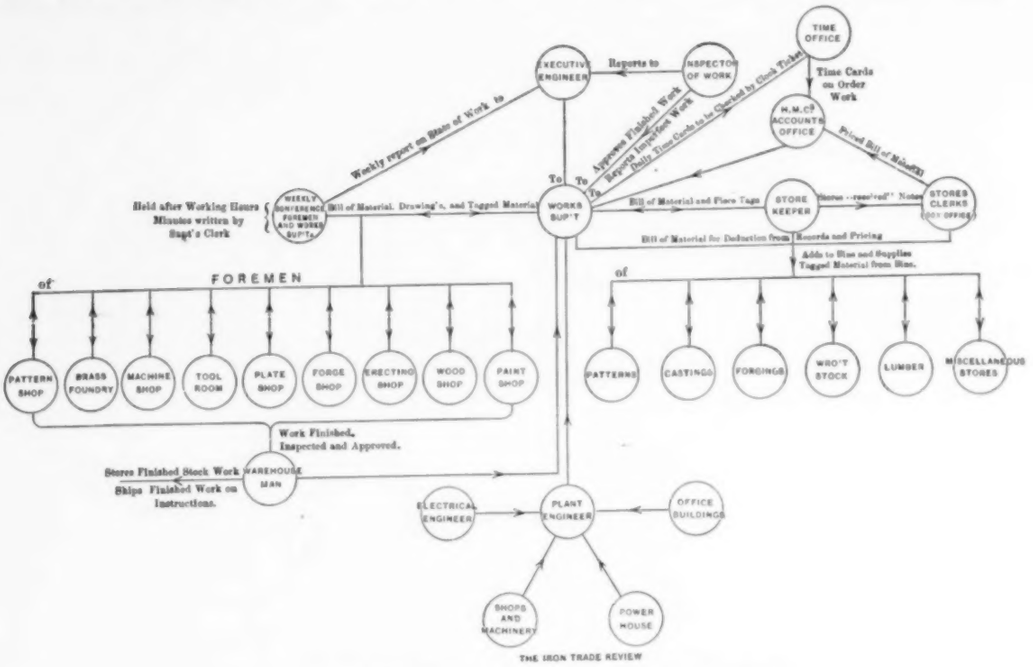

FIG. 5.—RESPONSIBILITIES OF WORKS SUPERINTENDENT.

the factory is scrutinized from these, daily and weekly, by comparing the ratio of the assignable and non-assignable expense items to each other, to the total expense, to the credited expense, and to each item of departmental expense. In this way shop leakages are not permitted to run on until an annual

for each class of standard design, the changes or improvements to which are not properly assignable to a shop order. The weekly graphical balance has a separate analysis embracing such detail. It is then seen exactly where the office expenditure is going, and any ill-considered or unnecessary

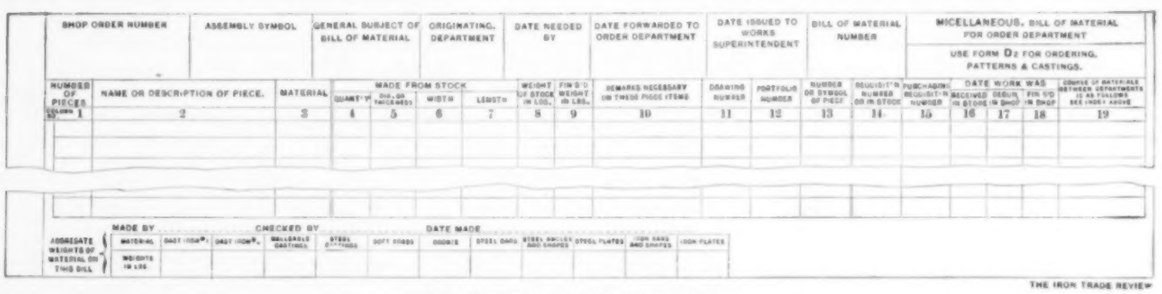

FIG. 6.—BILL OF MATERIAL. D-1.

audit reveals them, and it is found very convenient to run production costs and expense accounts together. This is independent, of course, of the factory production weekly balance, which is similarly submitted. It might appear that a good deal of clerical labor would be necessary, but this is not so,

outlay on drawing office labor is checked at once. Where no specific analysis of office expenditure is made, it is amaz- how much labor over a drawing board can be thrown away. In a manufacturing establishment well established, the assignable labor will be small for the drawing office, the staff low, and the work chiefly judicious amendment and improve-

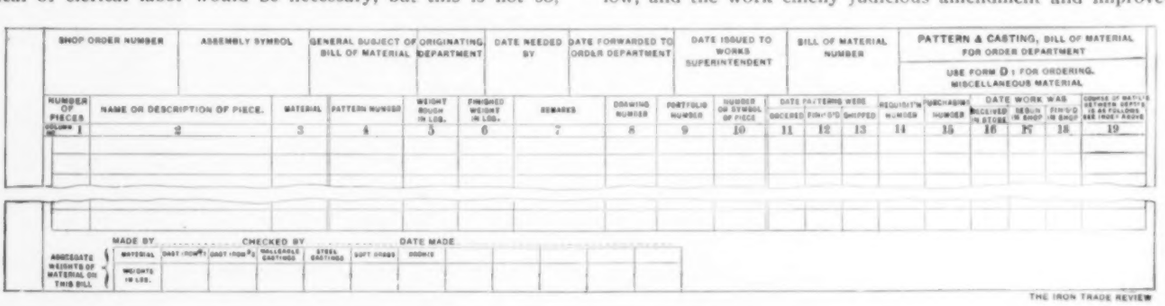

FIG. 7.—BILL OF MATERIAL. D-2.

owing to the collection of the necessary data being largely automatic by means of the existing production and cost forms; and the final compilation or summary of either production or cost occupies but a brief portion, daily and at week ends, of the time of one clerk. This form is shown in Fig. 16.

ment of standards, as experience directs. The "Awards Committee" collects from suggestion boxes throughout the plant, any proposals from workmen, other than foremen, regarding cheaper methods, better routing or reduction of production cost in any way. Only suggestions actually adopted are paid for. No prizes are offered.

PROTECTIVE COATING FOR IRON AND STEEL.*

The three meetings of the committee held during the year have so far been confined to discussing the best methods of obtaining the desired data for a comprehensive report on this subject. Before beginning this work it was considered necessary to put in concrete form several working headings: 1. Requirements for a satisfactory protective metal coating. 2. Methods used and suggested to determine if the protective coating is efficient. 3. An index, with abstracts, if possible, of general and current literature bearing on this subject which has appeared in English, French, German and American publications. 4. A classified list of all coatings used or suggested for the protection of iron and steel.

FORM F

PIECE TAG	To be wired to piece in stores and remain attached in shops. Warehouseman will remove card before shipping and send it to Works Superintendent.
Shop Order Number	Piece Number
Assembly Symbol	Number of Pieces for Job
Class of Machinery	Description of Piece
Pattern Number	Portfolio Number
Drawing Number	Bill of Material Number

COURSE OF MATERIAL IN SHOPS

DEPT. NO.	DATE COMPLETED	DEPT. NO.	DATE COMPLETED

INDEX TO DEPARTMENT NUMBERS

NO.	DEPARTMENT	NO.	DEPARTMENT	NO.	DEPARTMENT
1	Stores	11	Forge	21	Warehouse
2	Cutting Off	12	Punch & Shear	22	Shipping
3	Lathes&Scwg.	13	Saws	23	
4	Mill'g & Sha's	14	Riveting	24	
5	B.M.G'r Cut'r	15	Flanging	25	
6	Turret Lathes	16	Setting Up	26	
7	Drills	17	Painting	27	
8	Benches	18	Patterns	28	
9	Planer	19	Brass Foundry	29	
10	Er'cting Bench	20	Wood	30	

FIG. 8.—PIECE TAG. FORM F.

Sub-committees on the first two subjects have submitted reports; sub-committees on the last two subjects report progress and request further time for final report. The report of the sub-committee on requirements for a satisfactory protective metal coating resulted in the following recommendations:

REQUIREMENTS FOR A SATISFACTORY COATING.

In preparation of surface for painting, it is considered necessary that surface be free from grease and dirt, and that all detachable mill scale and rust be removed. Material which cannot be removed by hammer and chisel or wire brush, it is thought, will not affect the durability of the coating. The use of the sand blast is recommended, provided it is the opinion of the engineer that the cost is warranted, but it is not considered necessary in all cases.

Application of the Paint.—It is recommended that the successive paint coatings should be as thick as possible, compatible with satisfactory spreading with the brush or machine. The brush marks should flow out. The paint should not contain any large amounts of volatile matter, so as to chill the surface by evaporation.

Drying.—It does not seem possible, without further experimentation, to reach a final conclusion on this point. Whether the paint coats shall dry in six or twenty-four hours is a matter to be determined by the contingencies of the case. In general, it is recommended that as much time as possible be allowed between coats. It is, however, considered practicable to have an efficient metal coating dry in eight hours.

Successive Coatings.—The under coatings must not be softened or acted upon by the subsequent coats of paint.

Protective Power.—This is the keystone of the whole subject. The coating must protect. To accomplish this is is recommended that the coating must have the maximum impermeability to moisture, air, and carbon dioxide. Iron and steel will not rust in dry air or in water free from air and carbon dioxide. The best protection will, therefore, be obtained from the most impervious coating. To this end the pigment should be as finely ground as possible; and, finally, it is recommended that the vehicle or pigment, or both, be water repellent. Whether this last characteristic is to be obtained by a pigment such as lamp black, or by the use of some non-drying oil, must be the subject for further investigation.

Durability.—It is the opinion of the committee that coatings should be efficient under ordinary conditions for at least five years. The durability measures the life of the coating; it should therefore adhere to the metal through all ranges of contraction and expansion without peeling or cracking.

Neither the pigment nor the vehicle, nor compounds resulting from a reaction of the two, should cause a disintegration of the coating. It is further recommended that the coating should not be affected by products necessary for the maintenance, equipment or use of the structure protected. This applies especially to the softening of paint on bridges by burning and lubricating oils from passing trains. It is finally recommended that the coating be of such a character as to successfully resist the mechanical injury due to sand, cinders, and other material carried by the wind.

Feasibility of Recoating.—There can be no question that a satisfactory coating must permit recoating when needed without additional labor for cleaning and removing old coat.

Cost.—Upon this point it is only necessary to say that the other valuable requirements being obtained, that coating is best which can be furnished and applied at minimum cost.

SUB-COMMITTEE REPORT ON TESTS OF COATING.

It is the opinion of your committee that it is useless to prescribe the same tests to all classes of protective coverings. An efficient coating in the dry atmosphere of the Western states may fail to withstand the moist saline air of the coasts. A coating which is perfect for structural steel under a static

No, C.1. ANALYSIS.

Customer,
Address,
Machinery,
Date of Sale,
Sales Number,

Each contract must be carefully examined in detail, and the general results noted. Each point that may possibly be misunderstood, misconstrued or that is not definite must be noted below in such detail as may be necessary. Suitable steps must then be taken to settle definitely each point, and the result must be noted on this blank, with the authority for the decision. Special drawings needed in the construction or erection must be noted. Entries to be made in BLACK, subsequent changes in RED ink.

Note below the essential parts, special features, variations, and every matter to be kept in view.	Date for the completion of the plant and of its component parts.	Initials of the person filling out each line.	MEMORANDA.	

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FIG. 9—PRELIMINARY ANALYSIS. WHITE SHEET.

*Report of Committee, S. S. Voorhees, Washington, D. C., chairman, presented at the Delaware Water Water Gap meeting (July, 1903) of the American Society for Testing Material.

load may fail entirely when subjected to vibratory shock imposed on bridge members and steel cars. In short, tests must be in harmony with conditions imposed in service.

The general cause of failure of coatings to protect is the same as the corrosion of the metal itself, *i. e.*, moist air and carbon dioxide. Dilute acids, as a rule, have far less action on paint films than alkaline solutions. A paint made from some inert pigment and linseed oil will show no sign of disintegration when immersed for days in a dilute sulphuric acid solution which would rapidly dissolve the metal it protected, and the same paint would go to pieces in a few hours when exposed to the action of a correspondingly strong solution of ammonia or carbonate or caustic alkalies. Strong acid solutions rapidly destroy the coating, but it is rare that such conditions exist, and, if necessary, can be met by special requirements.

It is recommended that tests be adapted to the demands of service conditions, and divided into three broad classes:

1. Actual service tests, under normal conditions, applied to structure to be protected.

2. Accelerated tests, applied to specially prepared surfaces, and subjected to abnormally severe conditions.

3. Chemical tests to determine the constituents and adulterations of the pigment and vehicle, as far as the knowledge of the subject will admit.

It is undoubtedly true that the first set of tests gives the desired information in a most conclusive manner, but, unfortunately, the truth comes too late to remedy the evil if the protection is insufficient to prevent corrosion.

It is further considered that the function of this committee is not to specify any covering or coverings as protective, but to specify tests which coatings must stand to assure maximum efficiency. It will therefore be necessary to work along the lines of accelerated and chemical tests, selecting those which harmonize with the results of long-time service experiments, and ultimately formulating laboratory tests which can be relied upon to give the desired information.

It should, however, be realized that in this work chemical analysis must be used to supplement experience, not to provide it. In general, it is known by previous experiments that certain pigments and oils give durability and protection, while others fail in these essentials; but it will not do to condemn the unknown without the aid of experience.

Customer, Address, Class of Machinery, Date of Sale, Sales Number,	No. C.2. TIME SCHEDULE. Estimated dates in BLACK and revised dates in RED. This sheet is to be used to note all variations, adaptations, new designs and purchased articles; also the connecting up with other contractors, and every matter that affects the machinery delivery, erection, testing and turning the machinery over to the customer.												
Description of the class of Machinery and of its component parts.	Number or Quantity	Working drawings and shop orders must be completed	Material must arrive at our Works	Finished article to go to Warehouse	Goods should be shipped to the Customer	Should arrive at their destination	When to be turned over in working order	Estimated number of days work for our Shops. Machine Shop	Sheet Iron	Wood Working		Initials of the person filling each line	REMARKS. Notice to shipping clerk and controller and notes on design.

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FIG. 10.—FACTORY WORK. YELLOW SHEET.

A review of the suggested accelerated tests shows a variety of methods to impose abnormally severe conditions. These tests have in some cases little connection to service requirements, but it is believed that the results obtained by the methods selected will be in harmony with long-time service tests.

It is expected that the following series of experiments can be conducted through the co-operation of railroads and consumers on one hand, and the manufacturers of standard coatings on the other, the former to provide the structure and labor and the latter the material to be applied:

It is recommended that two coats of the protective coating be applied to parts of full-sized structures, not less than one span of a bridge, one steel freight car, or, in general, one unit of dimensions corresponding to above. The surface to be prepared and coating to be applied as recommended under those headings.

Customers Name Address Class of Machinery Date of Sale, Sales Number	No. C. 3. DRAUGHTING ROOM WORK.									
Class of Machinery and a list of parts for which drawings are required, both for construction and new designs.	Date for the completion of drawings	Drawing Order Number	Name of the Draughtsman assigned	Working Drawings Started Work	¼ done	½ done	¾ done	Drawings Shop Orders and Material List ready to issue	Shop Orders delivered to Supt.	Memoranda

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GIG.—11.—DRAFTING ROOM. PINK SHEET.

Customer Address Machinery Date of Sale, Sales Number	No. C. 4. MATERIALS AND WORK FROM OUTSIDE SUPPLIERS.									
List of Articles to be procured from Outside Suppliers When we have a portion on hand and the remainder must be ordered, so note in proper column.	Amount on hand and available	Part to be made in our Shops	Amount to be ordered outside, of Supplier	Ordered of whom	When the Drawings and order were sent to Purchase Dept.	Purchase Departments Number	When the Shop Order was delivered to the Supt.	Number of our Shop Order	When the Articles are wanted at our Works	

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FIG. 12.—PURCHASING REQUIREMENTS. BLUE SHEET.

At the same time, panels of tank steel 20x24x¼-inch are prepared and coated in the same manner as the structure and with the same batch of coating. The panels are coated on both sides and on edges of sheet. The work to be done indoors under favorable conditions for drying.

The panels are to have a ¼-inch hole bored in middle of upper end to facilitate hanging, and are to be stamped with serial number on both sides in upper left-hand corner.

Panels are prepared as above in pairs, one to be exposed "green" and the other to be thoroughly dried under favorable conditions before testing. The corresponding pair of "green" and dry panels are exposed under the roofs of train sheds, in roundhouses directly over smokestacks of engines, from trusses of bridges, on roofs of train sheds, roundhouses, and on roofs adjoining powerhouse stacks, etc., in tunnels, on docks in salt water and tidal rivers, where they will be immersed twice every 24 hours in salt and fresh water in the ebb and flow of tides.

In addition to above series of field panels, special laboratory panels on glass and tank steel are prepared in the same manner as the foregoing. The steel panels are exposed to the action of exhaust steam at a temperature not to exceed 150 degrees F. for 12 hours each day, and ordinary atmospheric air for the remaining 12 hours; the test to be continued for 30 days.

The porosity is determined by noting the absorption of a drop of oil on the coating. If the film is impervious, the drop of oil will run down the panel in a narrow band the width of the original drop, but if the life of the coating has been destroyed the drop of oil will spread out to a more or less greasy blotch, depending on extent of disintegration.

The glass panels are tested for water repellent properties by treating the dried coating with a few drops of water. Evaporation is prevented by means of a cover glass, and the coating examined after the water has been in contact for 12 hours.

The capacity of the coating to withstand destructive agencies necessary to equipment and maintenance of structure will require special tests.

For steel cars and bridges the coating on glass is tested with lubricating and burning oils to determine if it is disintegrated. For refrigerating cars it is tested in the same manner with a common salt solution.

A further set of laboratory tests is made by coating saucers of sheet iron 8 inches diameter 1 inch deep with two coats of paint. These saucers are filled with ordinary tap water and allowed to evaporate under cover to dryness; the water renewed until definite conclusions can be deduced.

Chemical analysis of the coatings will also be made to determine percentage of pigment, oil and volatile matter, with composition and quality of each.

The above service and laboratory tests are to be conducted at as widely distant points, and under as different conditions, as possible. The service tests are to be carefully examined at stated intervals, and the entire series of experiments accurately tabulated for comparison with the long-time service tests.

From these data it is expected that laboratory tests can be formulated which, when met, will insure a satisfactory protective metal coating.

INCREASED PIG IRON PRODUCTION IN CANADA.

The American Iron & Steel Association has received direct from the manufacturers the statistics of the production of pig iron in Canada in the first six months of 1903. The figures show a considerable decrease as compared with either of the two halves of 1902, as will be seen by the following table, which gives the production by fuels, in gross tons, in half-yearly periods.

Fuel used—Gross tons.	First half of 1902.	Second half of 1902.	First half of 1903.
Coke	147,892	154,820	123,500
Charcoal	9,912	6,933	9,430
Total	157,804	161,753	132,930

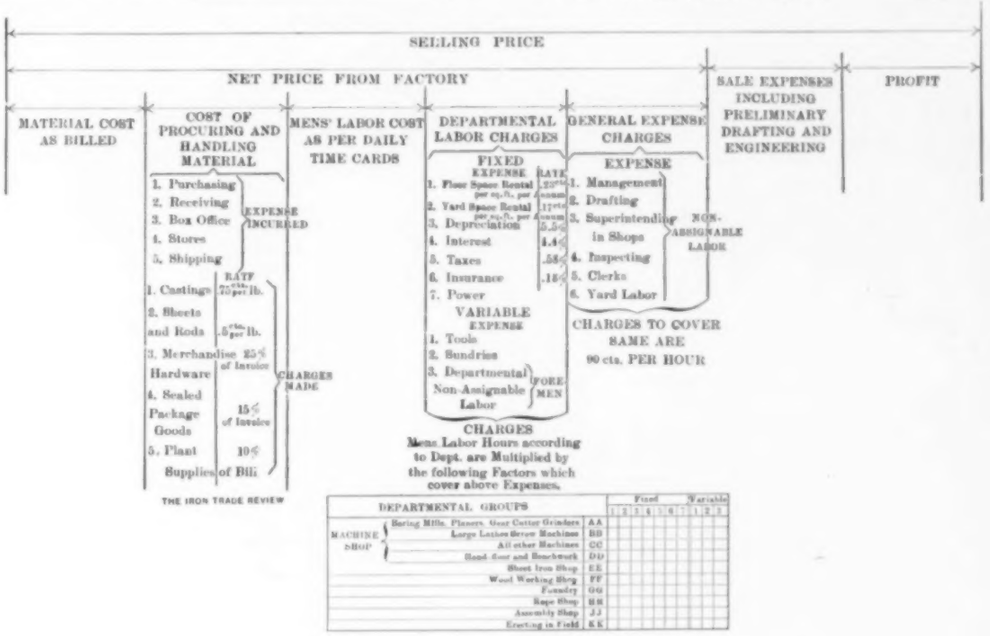


FIG. 13.—ANALYSIS OF COSTS.

The decrease in production in the first half of 1903 as compared with the first half of 1902 was 24,874 tons, or over 15 percent, and as compared with the second half of 1902 it was 28,823 tons, or over 17 percent. Of the total production in the first half of 1903, 69,325 tons were basic pig iron, against 57,209 tons in the first half of 1902 and 50,106 tons in the second half of that year. A small quantity of Bessemer pig iron was produced in the two halves of 1902, but no Bessemer pig iron was made in the first half of 1903.

The unsold pig iron held by Canadian manufacturers on June 30, 1903, none of which was intended for their own consumption, amounted to 13,585 gross tons, as compared with 20,041 tons on Dec. 31, 1902, and 37,721 tons on June 30, 1902. Of the unsold stocks on June 30, 1903, about 200 tons were made with charcoal, the remainder being coke iron.

On June 30, 1903, Canada had 14 completed blast furnaces, of which 9 were in blast and 5 were idle. Of this total 9 were equipped to use coke for fuel, 4 to use charcoal, and 1 to use mixed charcoal and coke. In addition 1 charcoal and 3 coke

FORM E. TIME CARD — ALL WORKMEN ARE ENGAGED BY THE HOUR

SHOP ORDER NO. | DRAWING NO. | PIECE NO. | THIS COLUMN TO BE FILLED IN BY H. M. C. OFFICE

OPERATION | DEPT. | MACHINE NO. | MONEY VALUE

WORKMAN'S NUMBER | DATE | HOURS | QUARTERS

WORKMAN'S NAME

REMARKS

TIME O. K. (BY FOREMAN) | TOTAL TIME FOR DAY | HOURS | QUARTERS

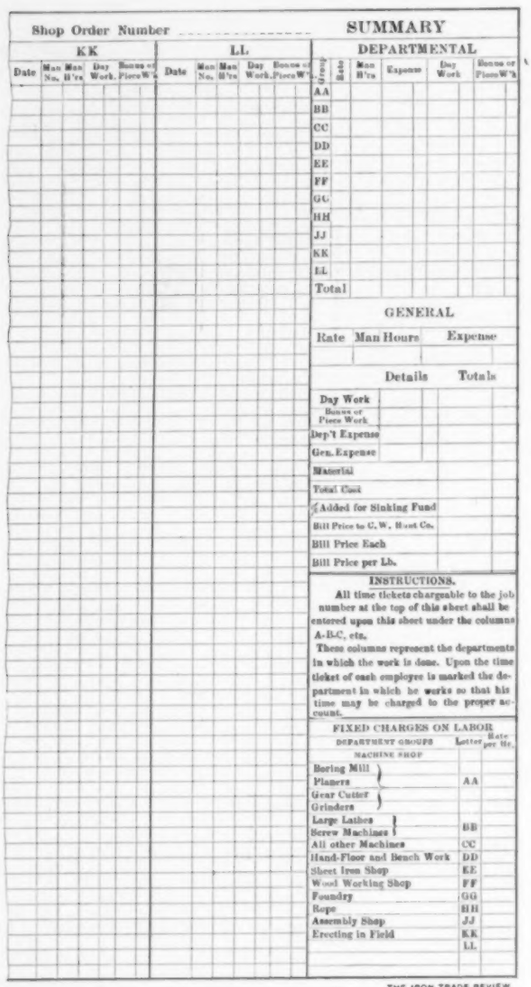
One of these forms must be filled out for each separate job upon which a workman is employed on any day. Pay will otherwise be withheld. The forms are to be handed in every night to timekeeper.

FIG. 14.—TIME CARD. FORM E.

furnaces were being built on June 30, 1903, and 2 coke furnaces were partly erected. Work upon the latter furnaces was suspended.

In connection with the above statistics the *Bulletin* gives the following concerning the plans and status of Canadian blast furnaces:

The Bridgeville Mining Co., of Bridgeville, Nova Scotia, is now the owner of Bridgeville furnace. It has been long idle


Shop Order Number _____ SUMMARY

KK | LL | DEPARTMENTAL

Date | Man Nos. | Man H'rs | Day Work | Bonus or Piece W'k

Dept'l Rate | Man H'rs | Expense | Day Work | Bonus or Piece W'k

AA BB CC DD EE FF GG HH JJ KK LL Total

GENERAL

Rate | Man Hours | Expense

Details | Totals

Day Work
Bonus or Piece Work
Dep't Expense
Gen. Expense
Material
Total Cost
% Added for Sinking Fund
Bill Price to C.W. Hunt Co.
Bill Price Each
Bill Price per Lb.

INSTRUCTIONS.

All time tickets chargeable to the job number at the top of this sheet shall be entered upon this sheet under the columns A-B-C, etc.

These columns represent the departments in which the work is done. Upon the time ticket of each employee is marked the department in which he works so that his time may be charged to the proper account.

FIXED CHARGES ON LABOR

DEPARTMENT GROUPS | Letter | Rate per Hr.

MACHINE SHOP
Boring Mill, Planers, Gear Cutter, Grinders } AA
Large Lathes, Screw Machines } BB
All other Machines CC
Hand-Floor and Bench Work DD
Sheet Iron Shop EE
Wood Working Shop FF
Foundry GG
Rope HH
Assembly Shop JJ
Erecting in Field KK
LL

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FIG. 15.—SHOP ORDER SHEET, K-1, SHOWING DAILY, WEEKLY AND FINAL BALANCE OF FACTORY COST OF ANY ORDER.

and is not likely to resume work. When last in operation it used mixed charcoal and coke.

The Londonberry Iron & Mining Co., Ltd., of Londonderry, Nova Scotia, expects to have one of its two furnaces rebuilt and in operation by Oct. 1. Neither furnace made pig iron in the first half of 1903.

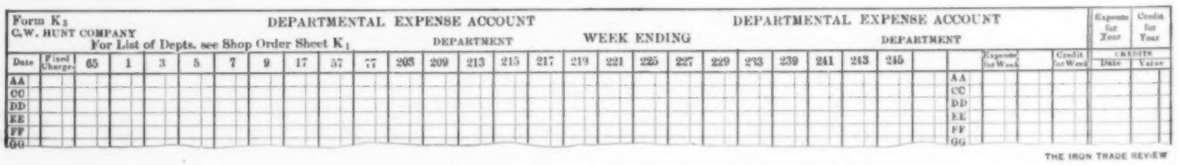
The Nova Scotia Steel & Coal Co., Ltd., of New Glasgow, operated its coke furnace at Ferrona for 19 weeks during the first half of 1903. The company is building a new coke furnace at Sydney Mines, Cape Breton, which it now hopes to have completed early in 1904. This furnace will be 85 by 17 feet and will have a daily capacity of about 200 tons of basic and foundry pig iron. The daily capacity of the furnace at Ferrona is about 90 tons.

The Canada Iron Furnace Co., Ltd., operated its charcoal furnace at Radnor Forges P. O., Quebec, for 21 weeks during the first half of 1903. Its Midland furnace, at Midland, Ont., which uses coke for fuel, also ran for 21 weeks. Both furnaces were blowing on June 30.

John McDougall & Co., of Montreal, had one of their two charcoal furnaces at Drummondville, Que., in operation for 26 weeks during the first half of 1903. The idle furnace will be started about Oct. 1.

The Algoma Steel Co., of Sault Ste. Marie, Ont., had not blown in either of its two furnaces on June 30, although both stacks were practically completed on that date. One stack will use charcoal and the other will use coke. Both are expected to be blown in early in August.

The Hamilton Steel & Iron Co., Ltd., of Hamilton, Ont., operated its coke furnace for 17 weeks and 4 days during the first half of 1903, making foundry pig iron. The furnace was in blast on June 30.


Form K2 DEPARTMENTAL EXPENSE ACCOUNT DEPARTMENTAL EXPENSE ACCOUNT

C.W. HUNT COMPANY For List of Depts. see Shop Order Sheet K1 DEPARTMENT WEEK ENDING DEPARTMENT

Expense for Year | Credit for Year

Date | Fixed Charges | 65 | 1 | 3 | 5 | 7 | 9 | 17 | 57 | 77 | 203 | 209 | 213 | 215 | 217 | 219 | 221 | 225 | 227 | 229 | 233 | 239 | 241 | 243 | 245 | Expense for Week | Credit for Week | CREDITS Date | Value

AA CC DD EE FF GG

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FIG. 16.—FORM K-3. WEEKLY SUMMARY OF FACTORY DEPARTMENTAL EXPENSES.

Milling Cutters With Soft Centers.

A method of producing milling cutters forms the subject of a recent patent granted to Mr. Monkemoller, of Staffenbergstrasse, Stuttgart. The invention, according to the *Mechanical Engineer*, consists in casting the cutter out of wrought iron or comparatively soft steel and adding the required carbon to the shaped tool in the case-hardening process. In carrying out the process wrought iron or a soft steel containing 0.2 or 0.3 percent carbon is melted in a crucible and refined in a molten state. Aluminum is then added, and the mixture is poured into the mold, which corresponds in shape with the finished tool, with due allowance for shaping and finishing. The casting is then cooled and shaped like soft cast or wrought iron. When finished the required percentage of carbon is added during the case-hardening process, which is carried to any desired depth, leaving, however, a core in soft condition, which, the inventor claims, considerably increases the ability of the tool to resist shocks, etc.

"The State of Allegheny."

Allegheny County, Pa., made 52.5 percent of all the pig iron that was made in Pennsylvania in 1902; 73.5 percent of all the Bessemer steel; 57.2 percent of the open-hearth steel; 70.3 percent of the crucible steel; 65.3 percent of the total production of all kinds of steel; 62 percent of the Bessemer steel rails; 65.9 percent of the structural shapes; 55.9 percent of the plates and sheets; and 58.5 of the total production of all kinds of rolled products.—[Bulletin of the American Iron and Steel Association.

Based on its production of pig iron in recent months the Sloss-Sheffield Steel & Iron Co. has become the leading merchant pig iron producer in the South. The actual surplus earnings of the company for June, after deducting bond charges and taxes, were $130,007, which was $10,007 above the preliminary estimate, and an increase of $350,390 over the corresponding month last year.

The plant of the Hartford Axle Co., Dunkirk, N. Y., has been sold under foreclosure, F. W. Smith, as trustee for bondholders, paying $10,800.

The directors of the Commercial Club of South McAlester, I. T., have endorsed the proposition of G. M. Williams, Kansas City, Mo., to establish a steel manufacturing plant at South McAlester. The plant will cost $126,000 and will employ 500 men. The city of South McAlester is to give a site of ten acres and subscribe $5,000 in stock.

The Burns Boiler Co.'s plant, Green Bay, Wis., is rapidly nearing completion. A part of the plant is now in operation.

Works of The Waterbury Farrel Foundry & Machine Co.

The plant of the present Waterbury-Farrel Foundry & Machine Co., of Waterbury, Conn., was started in 1851, and in 1857 was conducted in connection with the Ansonia foundry under the name of the Farrel Foundry & Machine Co. and so continued until 1880. In the latter year the present company was organized as the Waterbury-Farrel Foundry & Machine Co. The shop like many others in New England had no especial choice out of the many outlets for the stock of ingenuity and undertook a varied assortment of work in order to keep the business moving in the direction of a probable profit. When times were dull and orders scarce the men were employed upon such equipment as the working demands of the plant would digest and the management built vertical millers, traversing head shapers, and other machine tools. Some of these tools are of ruggedly substantial design and are profitable machines even at this much later date. The plant has never lost this adaptable faculty and today the product has an extensive range. Machinery for rolling mills, wire drawing, tube making, thread rolling and cold heading is made in many forms and sizes. Automatic nut machines, power presses, shears, automatic forging drops, hinge machines, cartridge machinery, hydraulic tools, presses, accumulators and pumps, special machinery for the manufacture of cigars, cigarettes, etc., are all regularly undertaken as demand arises. The many neighboring brass interests account for the complete line of machinery for the manipulation of brass in tube, sheet or specialties. As an instance of the size of the work handled, some machinery is at present under way in the shop for the manufacture of seamless tubing which will weigh 250 tons. This machinery, by the way, is for export and will handle pipe up to 18 inches by 18 feet.

The site of the plant has obvious advantages and disadvantages. The location in the center of the city and alongside the railroad track is an excellent one but the size and shape of the land leave much to be desired. Back in the earlier days of the manufacturing history of the plant the area was ample and it was not expected that the business some time in the future would call for a force of 500 men at the shop. The plant has grown irregularly also and the shops and their equipment up to recent years had by accident rather than design filled the later needs as they developed.

A consideration of the general view of the plant illustrated in Fig. 1 and the diagram showing the location of the buildings and the shape of the land available for manufacturing purposes will indicate the method of accumulation which developed with the growing requirements of the business. The power plant is at 1, the elevator and wash rooms at 2, the heavy machinery and erecting departments at 3 and extending along Bank St., the smith shop is at 4, rough stock department at 5, chucking and screw making departments at 6 and 7, office at 8, pattern shop, storage and extension at 9 and 10, the brass foundry at 11 and the main foundry is seen at 12. The dotted lines between 7 and 12 indicate a three story extension for which plans have been made. This will increase the casting cleaning capacity of the foundry on the one hand and on the second floor and the third will add to the screw cutting and milling departments. A pattern storage warehouse is also at the present time in progress on Jackson St., a short distance from the main plant, and when finished will be three stories with interior dimensions of 40x96 feet.

The project of simplifying the driving mechanism of the plant has just been carried out and is shown in the several views and more particularly in Fig. 3 where the equipment is numbered for reference. Here the power plant comprises two Bigelow 6 feet by 16 feet horizontal tubular steel boilers, 5

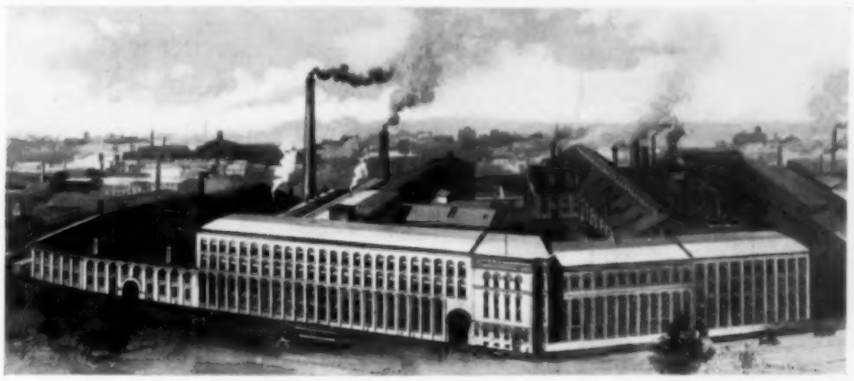


FIG. 1.—PLANT OF THE WATERBURY FARREL FOUNDRY & MACHINE CO., WATERBURY, CONN.

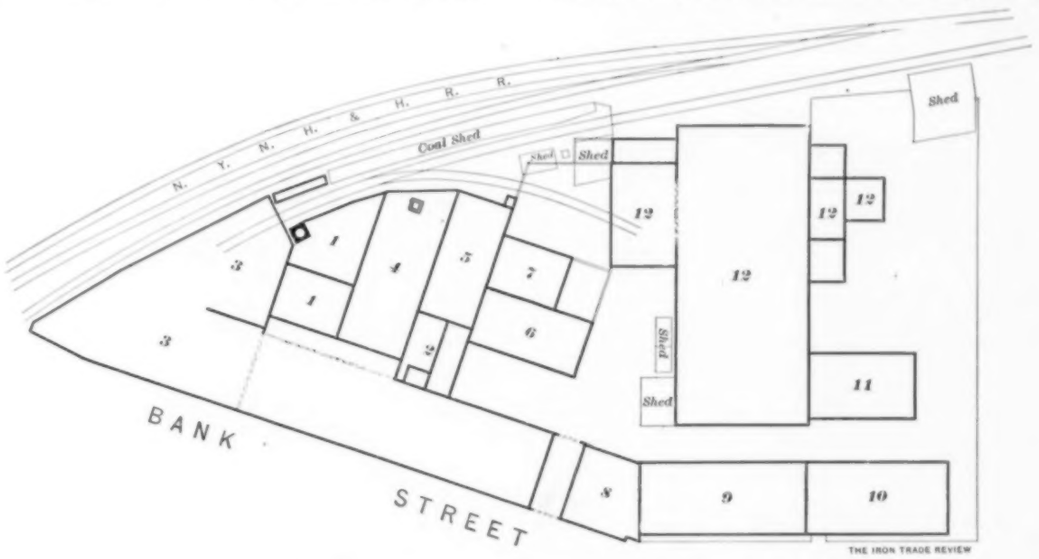


FIG. 2.—PLAN OF THE WATERBURY FARREL FOUNDRY & MACHINE CO.'S PLANT.

and 6; a Knowles 18x10x12-inch 1000 gallons, Underwriters' duplex steam pump, 7; a Worthington 9x4½x10-inch duplex steam fire pump, 8; two Knowles steam pumps, a duplex 6x4x7-inch duplex and a 16x12x8-inch single, 9 and 10; 12 is a Spencer automatic damper regulator and 2 a No. 4 Sturtevant forge blower. There is at 13 an 18x28-inch Sturtevant fan forge 6x8-inch vertical steam engine for heating and at 14 a Westinghouse 13x22x13 automatic cross compound vertical steam engine direct connected to a Westinghouse direct current, 100-

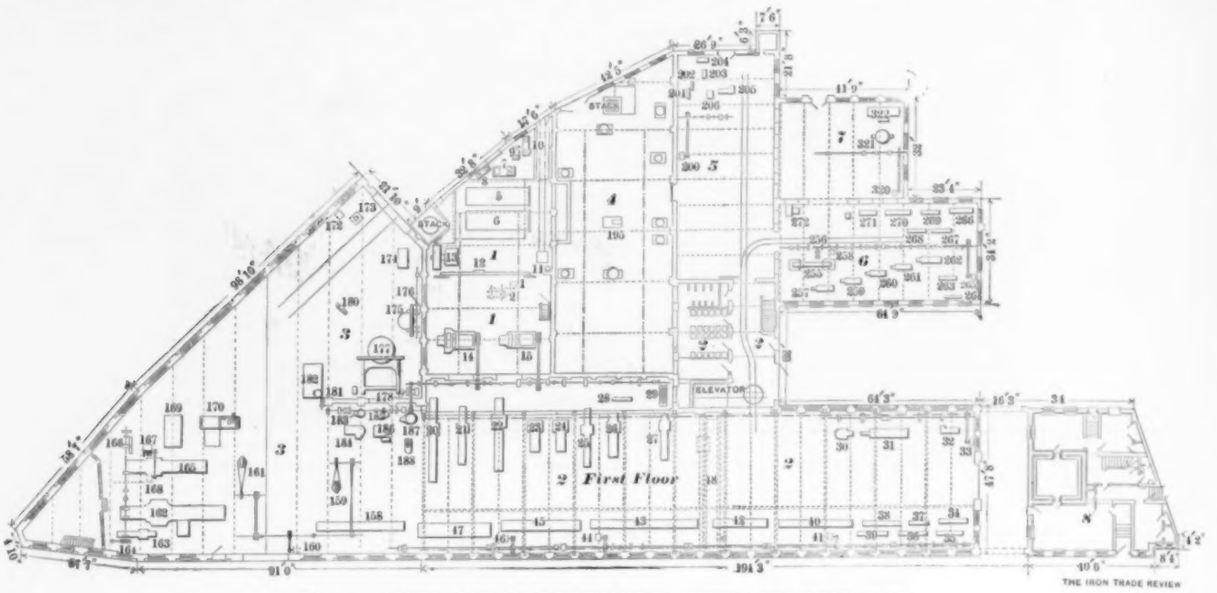


FIG. 3.—GROUND PLAN OF MACHINE SHOPS, OFFICE AND POWER PLANT.

k. w. generator. Another Westinghouse engine of the same type but 12x20x12-inches is shown at 15 and this is direct connected to a 75-k. w. Westinghouse generator. Both are run at 250 volts. At 16 is one of the National Pipe Bending Co.'s 24-inch by 500-ft. feed water heaters.

An examination of the driving arrangements will show that direct connection to the tools is not favored and the motors as a rule are attached on the group plan. A considerable amount of flexibility to the various departments of the plant is thus

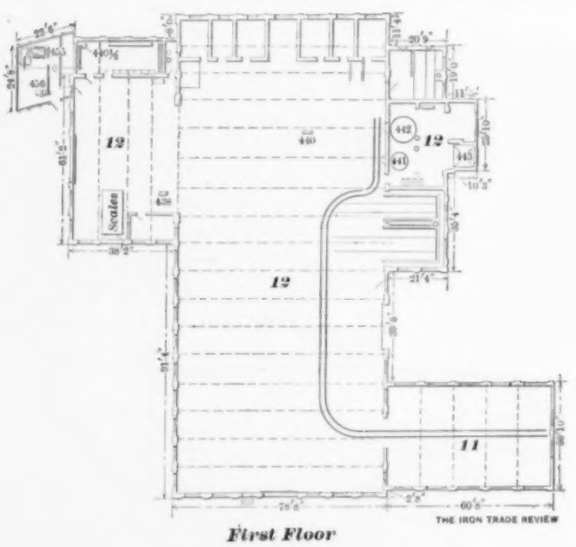


FIG. 4.—PLAN OF FOUNDRY.

secured. There is convenience of connection, and the fact that the large machines consume no energy when they are idle, as would not be the case if line shafts were involved, also that the belt drives admit of a simple attachment to the old machines with but little expense and that the change in working conditions could go on gradually without paralyzing the productive powers of the plant while improvements were in progress—in short, a large balance is in favor of the system as adopted and carried into effect. Of course increased output is the main consideration and its value is of much greater importance than economy in power. However, the saving in head room, the absence of long lines of shafting and the avoidance of other power wastes are incidental to the general scheme of motor equipment in its different forms.

The machines in Fig. 3, numbered from 20 to 29, are grouped together, the first eight being planers from 36x36 inches up to 48x48 inches; 28 is a 16-inch by 6-foot speed lathe and 29 is a grindstone of generous dimensions, 60x9 inches. A 36-inch vertical boring mill is shown at 30, and 31 and 32 are horizontal boring machines with 36x48-inch and 18x48-inch tables respectively. This latter group is driven by a G. E. 10-h. p. motor. The machines from 34 to 43 are driven by a 15-h. p. G. E. motor seen at 41 and this group of tools comprises lathes from 12-inch by 6-foot up to 36-inch by 35-foot. Two larger lathes, 45 and 47, are driven by the one motor, the 54-inch by 25-foot and a 66-inch by 24-foot being connected to the motor shown at 46, a G. E. 50-horsepower motor. The motor seen at 44 is also a G. E. of 25-h. p. and is used for testing. A line shaft conveys the power from the engines to the machines numbered from 183 to 187; these are radial and other drills. A 15-ton jib crane of 22-foot swing is at 180 and has a 5-horsepower motor. At 181 is another 5-horsepower motor connected to a 6½-foot radial drill at 182, and a 16-foot boring mill at 177 is driven by a 10-h. p. motor at 178. The 10-h. p. motor at 176 is applied to the 18-inch vertical slotter and the 5-foot boring mill indicated at 174 and 175. A windlass near the track is driven by a 15-horsepower motor and these are shown at 173 and 172. A Crocker-Wheeler 3-h. p. motor is at 11 and this motor takes care of the coal hoist. A Pawling & Harnischfeger traveling crane of 40,000 pounds capacity and 42-foot span is at 48. A 10-h. p. motor at 160 has a group of machines as follows: 158 is a 49-inch by 28-foot lathe, 159 and 161 two 15-ton jib cranes with 22-foot swing. The motor at 164 is 15-h. p. and has two planers, 162 and 163, 72x75 inches and 27½x27½ inches and a 13-inch by 5-foot speed lathe. A 15 h. p. motor at 168 has a 60x60-inch planer and a 24-inch planer at 165 and 167. A 36-inch shaper is at 169 and there is a 70x70 horizontal boring machine at 170.

A 5-h. p. motor drives the machines in department 5. These are as follows: Two shop saws, vertical cutting-off machine, 8x40-inch centering machine, cutting-off machine with 17x26½-inch table, automatic saw grinder, and are numbered from 201 to 206 in that order. A 6½-foot vertical wheel boring machine is seen at 321 and this is driven by a 10-h. p. motor which also drives a 64-inch by 11-foot pulley lathe. A 10-h. p. motor, 265, is utilized in department 6 and the equipment includes 5 lathes from 13-inch by 5-foot up to 50-inch by 8 1-2 feet, oil separator, 15 inch by 5½-foot turret lathe, these being numbered from 264 to 271.

The forge shop has an 800-pound steam hammer at 195 and two forges and two hardening furnaces. The latter being 24x72-

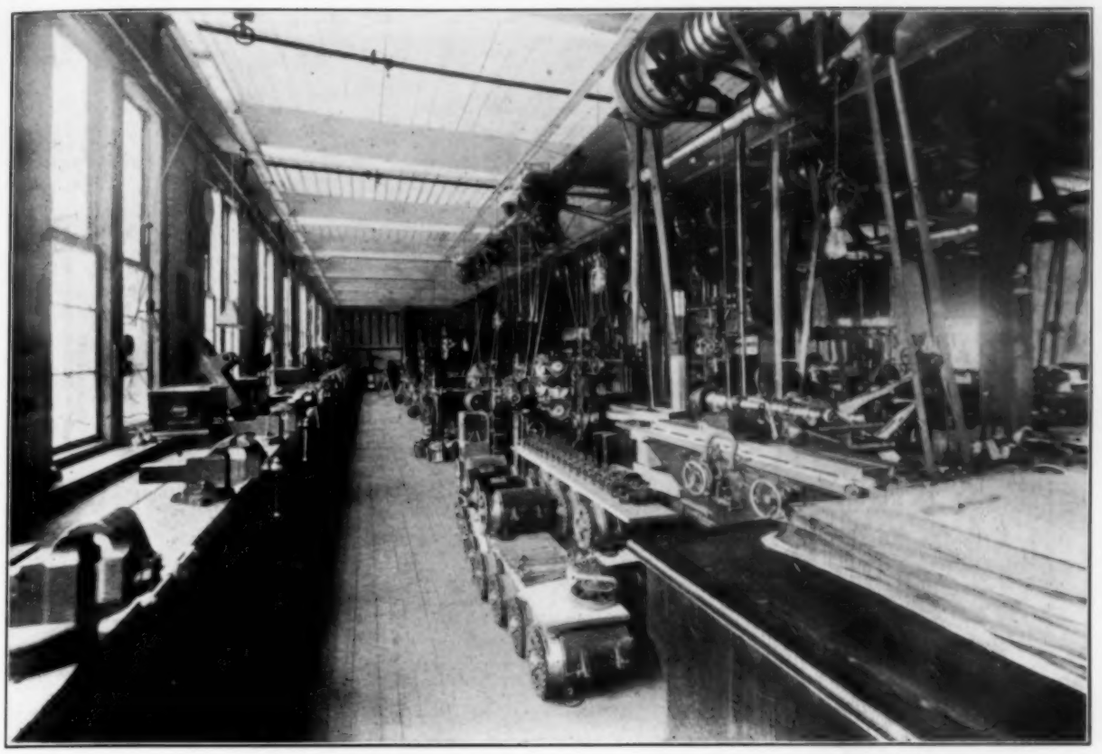


FIG. 5.—ONE OF THE MANUFACTURING DEPARTMENTS.

inch and 16x48-inch respectively. There are two smaller steam hammers and other forge shop tools.

The foundry has two cupolas, a 42-inch at 441 with 6 tons capacity and a 60-inch at 442 with 10 tons capacity. At 443 is the hydraulic elevator and there is a jib crane, 20½ feet swing with 10-ton capacity, at 436 with 7½-h. p. motor, a 27½-foot swing jib crane with a 15-ton capacity and a 10-h. p. motor at 438 and a similar machine of like swing and power at 440. A 10-horse power motor at 440 1-2 operates the rattler and emery wheels at 455 and 456.

Fig. 5 is a view of one of the manufacturing departments and incidentally shows another specialty made at the shop. The machines along the floor are for the Monarch engine stop which is manufactured in this department. A view of the first floor of the new shop is shown in Fig. 6 and this illustrates some of the heavy tools. A group of views taken from various parts of the shop are seen in Fig. 7. Here is a view of one of the two drafting rooms, the small cabinet drawing tables at the right of the larger boards were designed here and in size, convenience of drawers, etc., are found very useful. The heavy millers seen in the foreground of the next and lower view do not compare with the graceful lines of the Becker vertical milling machine at the rear but in point of working capacity the old tools are still found exceedingly serviceable. A gen-

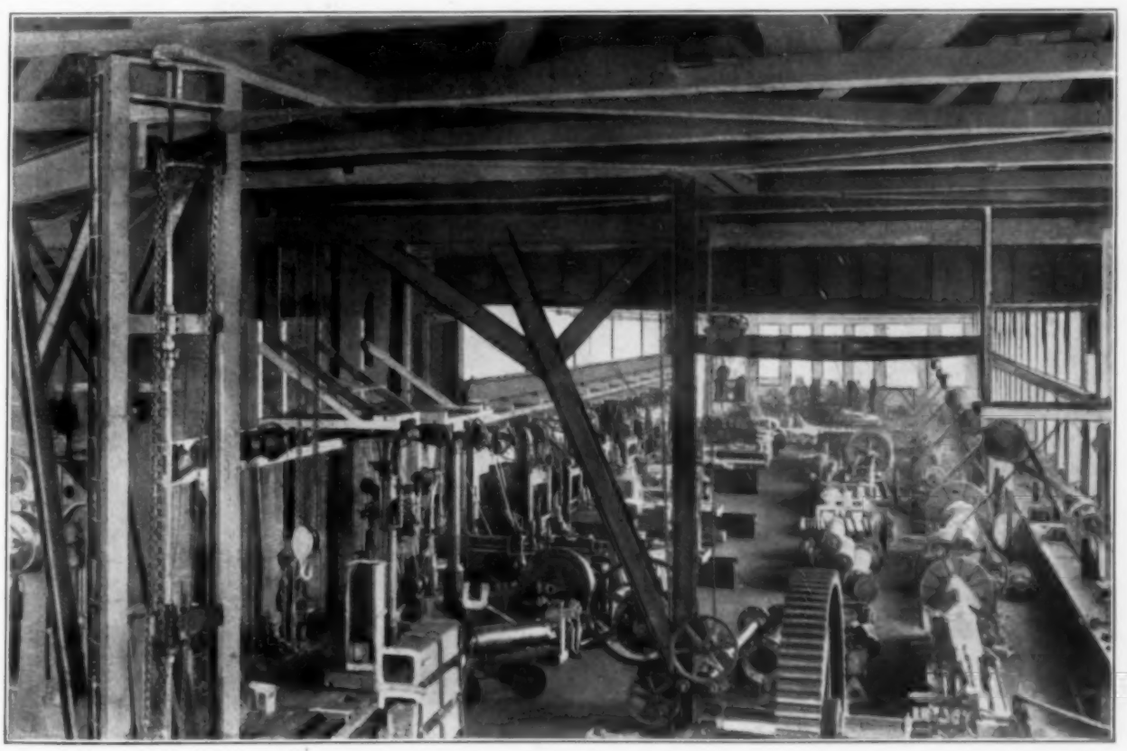


FIG. 6.—HEAVY TOOLS AND ERECTING DEPARTMENT ON GROUND FLOOR OF NEW SHOP.

One of the Drafting Rooms. A Manufacturing Department. Pattern Storage. Boring Mills and Jib Crane in No. 3.
A Milling Department. Group of Planers. One of the Washrooms. Elevator and Turntable.

Fig. 7.—VIEWS OF THE WATERBURY FARREL FOUNDRY & MACHINE CO.'S PLANT.

erous use of the Franklin and other cranes as will be seen is made in the shop. The view of the pattern storage also illustrates the method of handling the patterns. The several sections are lettered, A, B, etc., and the shelves are numbered from the bottom upwards, the stamped number on the pattern or on an order easily locating the piece. The view of the heavy jib crane from department 3 will also give a typical method of electric connection to both the crane and the boring mill. The illustration of the elevator suggests the free use of the Hunt Co.'s industrial railroad throughout the plant, and the group of planers as well as the washroom are alike indicative of the effort for system and comfort in the renewal of the old shops. The list of equipment given has been selected only to show the method of grouping. The machinery departments extend over several stories as will be seen by Fig. 1.

The men at the head of affairs have been with the company for many years. William E. Fulton is president and treasurer, George B. Lamb vice president and general manager, and David C. Griggs secretary. The Western office is at Cleveland.

Milling Machines vs. Planers.

We are frequently asked if milling is a less expensive method of doing work than planing. It is an exceedingly difficult question to answer, for both the planer and the milling machine occupy an important place in every machine shop and the use of neither can be dispensed with profitably.

Whether a certain piece of work can be done by one method cheaper than the other depends on many things, such as the quantity, shape, material, operator, cutters, machine and others. We have known of cases where twenty times as much was done on a milling machine as on a planer; again, where more could be accomplished by the planer, but as a whole, we believe the method of milling is gradually coming more into favor, and much work that recently was thought could only be done on a planer is now successfully performed by the miller, and with the advent of so-termed high grade steel and the construction of powerful milling machines, still more satisfactory results than in the past will be obtained, and we believe the difference in favor of milling machines much increased.

We are also asked if milling cutters are not very expensive, and their cost much more in proportion than planer tools to accomplish the same results. The time each cutting point or tooth of a milling cutter is actually in the work is usually very short; using a planer tool it is long. Therefore the cutter tooth has an opportunity to cool; the planer tool point has not. The milling cutter will do much more work as a rule per tooth without sharpening than the planer tool, and while the first cost of the cutter is much the most, yet in results is much the cheapest.

We find that failure to produce satisfactory results by milling is attributable in many cases to dull cutters; they should be kept sharp. Slow cutting speed and slow table feed, the distance the table moves per minute, is of the most importance, as it determines quantity of production; the quality by the condition and character of cutter. An end or face milling cutter, when the character of work admits of its use, usually produces the best results in quality and quantity of production and at the lowest cost of maintenance.—[The Beaman & Smith Co.

The Oscar Barnett Foundry Co., Newark, N. J., recently declared a dividend of 3 percent. Last year the company's dividends reached a total of over 16 percent on its capital of $50,000 and this year's are expected to be still larger. It was organized four years ago by the following Pittsburgers: Thomas Hannah, president; Gerald Hannah, secretary and treasurer; J. B. Hardy, engineer, and John Dewar, director. In addition to manufacturing all kinds of foundry supplies the company has a cutlery and plier department. Last year it built a new shop and now employs 130 men.

The American Car & Foundry Co. has received new car orders as follows: Atchison, 200 flat; Mexicon Central Railway, 50; St. Louis Southwestern, 5 baggage, 5 mail and baggage, 10 chair and 15 coaches; International & Great Northern, 100 freight; Missouri, Kansas & Texas, 13 chair, 1 postal, 21 coaches, 10 baggage and 18 combination.

ACME BENCH HAND TAPPER.

The numerous taps that are broken in the course of a year in all large machine shops account for the designing of such a tool as is here illustrated. The manufacturers, while realizing that automatic tappers and the tap wrench also have their place, offer the "Acme" bench hand tapper to fill the gap between the capacity of these tools, preventing the breaking of taps, increasing the accuracy of hand tapping and saving a great deal of time. By using the face plate all small pieces may be tapped either held free-hand or special holders of any shape may be bolted to the face plate. If large pieces are required to be tapped on the bench, the arm supporting the table may be swung back out of the way, thus allowing the pieces to sit directly on the work bench, which should be reasonably level. When not in use both arms may be swung back to leave the bench clear. Castings 12 inches high are within its capacity. The manufacturers are Hazelton & Donald, Discount Place, Philadelphia.

THE ACME BENCH HAND TAPPER.

South Deering Succeeds Irondale, Ill.

Irondale, Ill., adjoining South Chicago, is no more, the name of that place having been changed to South Deering. It is a thriving industrial town with blast furnaces, a steel plant, and a prospective coke plant. With the bitter recollections of a long strike and the feeling that the town should get away from old memories and take a fresh start, it was decided to change the name and organize an improvement club. The name of South Deering has been selected as a compliment to the Deering Harvester Co., which already has large interests in the town and expects to increase them. The Semet-Solvay Co., of Syracuse, N. Y., will build its western plant at South Deering at a cost of $1,500,000 and the product will be used in the Deering furnaces. In 1875 Joseph H. Brown Iron & Steel Co. was established at Irondale, and for the next 10 years it was one of the most prosperous industrial towns of the country. The Calumet Iron & Steel Co. succeeded the Joseph Brown Co., the product being cut nails. In a moment of dissatisfaction over supposed grievances, the workingmen in the nail mills went on a strike. A bitter struggle of 8 months followed and the cut nail industry never thrived after that time. Nearly all the defeated strikers were forced to seek employment elsewhere and the town did not prosper, but it now seems to be in a fair way to get a new start.

Charging the officers of the Leibrandt & McDowell Stove Co., Philadelphia, with gross mismanagement, a number of stockholders have asked that a receiver be appointed. The company was incorporated in 1869 and has a large plant. It is contended that for the last 10 years the business has been carried on at a loss of $74,961, and that, although the corporation's books show profits for the years 1900 and 1901, there were no such profits.

KEYSTONE SPECIAL MILLING MACHINE.

The illustrations show a special milling machine recently designed for heavy and exacting work. The bed is of deep pattern and is stoutly ribbed and braced throughout by box girders. The table is 6 feet long, fitted to the bed with wide dovetail bearings and provided with a steel shoe for taking up wear. The housings are also of box pattern and are made extra heavy, securely bolted and dowel pinned to the bed, and are fastened together at the top by a heavy tie frame.

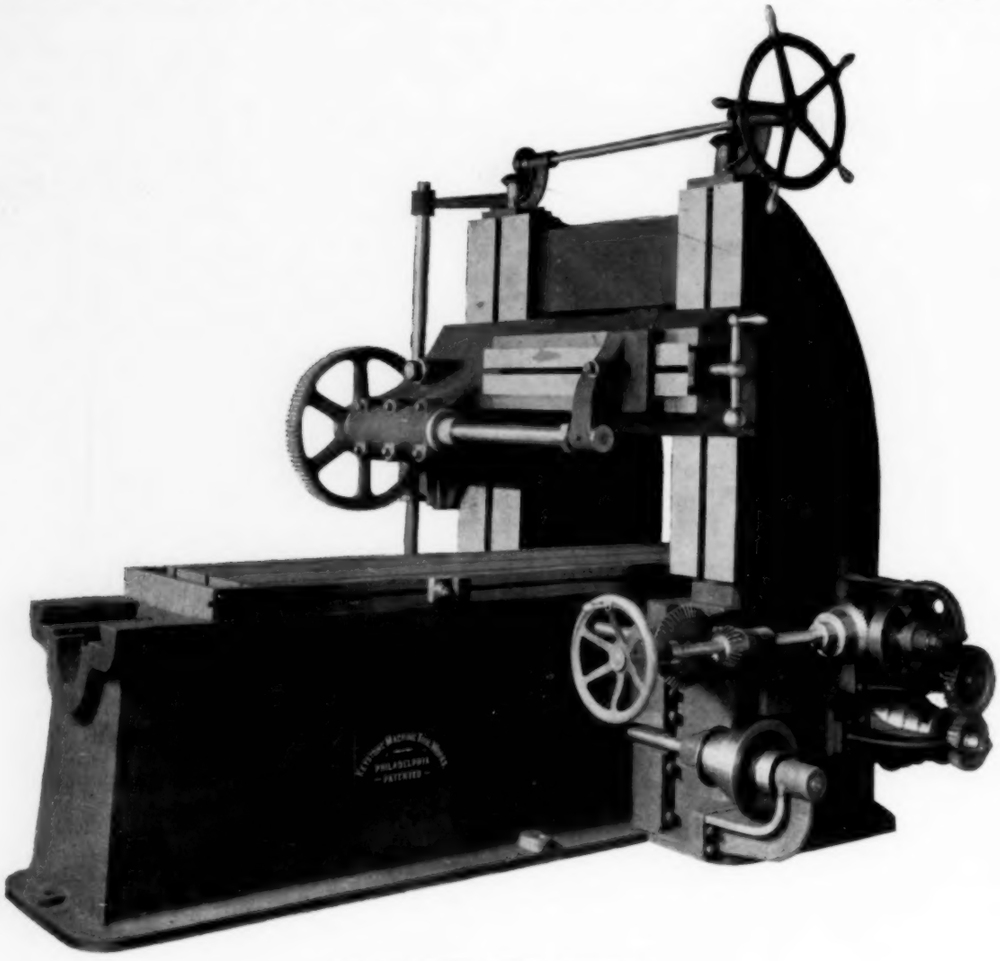


FIG. 1.—SPECIAL MILLING MACHINE.

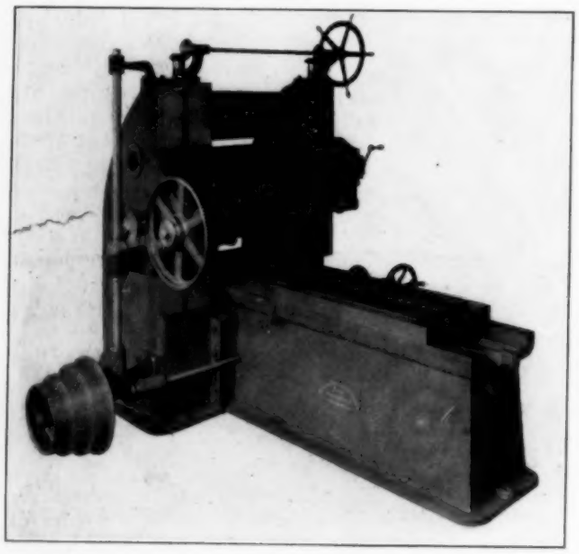


FIG. 2.—REAR VIEW OF SPECIAL MILLING MACHINE.

The cross rail is one of the special features of this machine, as it is built out to bring the center of the arbor 16 inches from the face of the housings for milling work too wide to pass between the uprights and as will be seen the bearings are made of ample dimensions to prevent any spring or chatter. The arbor is made of high carbon steel and is 2½ inches in diameter and supported at the end by an adjustable outer bearing which can be removed when a vertical milling attachment is used. The bearings will admit of cutters being used up to 15 inches diameter.

This machine will admit 34 inches in width and 36 inches in height between the housings. The main spindle is of cast steel and is 5½ inches in diameter and has a bearing in the head 22 inches long. The feeds are automatic and have 16 changes varying from ½ inch to 8 inches per minute. There is also a power quick return to table of 10 feet per minute.

The machine illustrated will mill a standard length of 8 feet, but can be made to mill any length. These machines are made either with belt drive or electric motor with direct gear or silent chain connection, as desired, and weigh complete, 16,000 pounds. They are built by the Keystone Machine Tool Works, of Philadelphia.

At the annual meeting of the stockholders of the Blakeslee Forging Co., Plantsville, Conn., the following directors were elected: Sherman Blakeslee, George W. Blakeslee, Charles Campbell, George S. Allen and James H. Pratt. The directors elected the following officers: President, Sherman Blakeslee; vice president and manager, George W. Blakeslee; secretary and treasurer, James H. Pratt. The company has done excellent business during the year, and a quarterly dividend of 1 1-2 per cent was declared.

John L. Johnson has been appointed receiver for the Hazleton Boiler Co., a New York corporation having a plant at Rutherford, N. J. Liabilities are placed at $127,000 and the assets at less than $10,000.

THE STERLING CLUTCH.

The Sterling clutch is illustrated in Fig. 1 in combination with a pulley. At the near side is shown a cone of the ordinary type with the sloping surface pressing against the projecting end of the key or clutch lever. The general principle of the clutch will however be better understood by an examination of Fig. 2. Here are two rings which are held in firm contact with one of the rotating pieces at the one end, and at the other are combined by the agency of the forked key or

FIG. 1.—STERLING CLUTCH ATTACHED TO PULLEY.

lever seen at the rear of the rings and having the projections pressing on the enlarged ends of the rings.

A movement of the end of the lever to the right and assuming that the opposite ends of the rings are firmly held, it will be readily seen that the adjoining surfaces of the rings will approach each other and grip any intervening piece.

The clutch has very few parts in combination. There is the cone to operate the clutch and a setscrew with a locknut and washer, a large open ring to which the setscrew, lock-

FIG. 2.—CLUTCH KEY AND RING.

nut and washer are applied at the one end, a smaller open ring, a forked lever engaging these rings as illustrated in Fig. 2 and a round box to contain these four parts. The key is laid in the box and the rings are sprung in to engage the forked lever.

The forked lever bears directly by simple contact upon the ends of the rings. The lever is not in a bearing in the general acceptance of the term but "floats" until the pressure against the ends of the two rings is equal. The setscrew is only employed for the regulation of the amount of pressure and cannot by the arrangement of the parts put any more pressure on the one ring than on the other. The stress comes within the clutch itself. The lever bears and fulcrums on one ring to thrust the other ring into place and thus forces both rings into frictional contact with the single movement. The rings are sprung to place and when released their free ends spring back promptly, clearing the surfaces.

The Sterling clutch in all the different applications to pulley, gear, sprocket and drum, or as cut-off coupling, is manufactured by the Kisinger-Ison Co., of Cincinnati.

NATIONAL STEEL FOUNDRY CO., OF NEW HAVEN, CONN.

The National Steel & Wire Co., of New Haven, Conn., has recently associated with it as a subsidiary company the new National Steel Foundry Co., recently organized by prominent New Haven manufacturers and others. This move is expected to be of great mutual advantage. With a varied line of the finest steel castings to add to the present output of all kinds of high grade specialties in rods, wire wire fencing, wire rope, telegraph and telephone wire, the National Steel & Wire Co. will have a greatly increased volume of business. The National Steel Foundry Co. has been able to purchase a part of the 50-acre site owned by the National Wire Corporation (also a subsidiary company of the National Steel & Wire Co.) a choice location for manufacturing purposes, having both railroad connections and dockage capable of accommodating ocean going steamers of large tonnage.

The foundry company will be able to re-melt in its open-hearth furnaces, all of the waste from the wire and rod mills of the National Wire Corporation, and thus much of the scrap necessary to make steel castings will be always provided for, with no freight to pay.

The National Steel Foundry Co. was originally organized to supply the trade of New England and New York, throughout which section there has been and is a great scarcity of steel castings. The connection of the new company with the wire company gives a broad market, as the National Steel & Wire Co. maintains selling departments in Chicago, Kansas City, San Francisco, and De Kalb, Ill., as well as in Boston, New York and New Haven. With a tidewater location in the heart of a thriving manufacturing section both companies have a ready market for finished products, while raw materials can be laid down on the docks at low freights.

The capital of the National Steel Foundry Co. is $300,000 and the plant which is now being erected is equipped to turn out 35 tons of finished product per day. The main building, which will contain the molding and casting departments, is 408 feet long by 160 feet wide and will contain two 25-ton acid open-hearth furnaces of 25 tons capacity each, and one 40 and three 30-ton traveling cranes. The necessary pattern storage, power house and gas producers will be erected at once. All the buildings are so arranged as to permit of extensions from time to time as an increased business may require, and without interruption to operations or altering of the general plan. Every effort is being made to complete construction so as to pour the first heat by January 1, 1904. The directors are Henry L. Hotchkiss, president L. Candee & Co., of the Union Trust Co., the Shoe Hardware Co. and New Haven Web Co.; Frank L. Brown, vice president and treasurer National Steel & Wire Co.; H. Sanborn Smith, vice president and secretary National Steel & Wire Co.; Frederick B. Farnsworth, president McLagon Foundry Co. and treasurer Eastern Machinery Co.; H. Stuart Hotchkiss, vice president and secretary L. Candee & Co.; Eugene Buckman and M. Sims, of New Haven. The officers are: Henry L. Hotchkiss, president; Frederick B. Farnsworth, vice president; H. Stuart Hotchkiss, treasurer; Eugene Buckman, secretary; M. Sims, manager.

The rapid growth of the steel casting industry in the past few years may be taken as a promise of much greater growth in years to come, as the business of the country increases and as gray iron castings are replaced by lighter and stronger castings of steel. The new company has issued an interesting illustrated pamphlet describing steel foundry operations and indicating many of the uses of steel castings.

The Cramp Steel Co., representing New York, Boston, Philadelphia and Canadian capital, expects to begin the manufacture of finished steel products at Collingwood, Ont., within the next week. The principal product will be wire rods. A contract for billets has been made with the Dominion Iron & Steel Co.

THE BLUE TICKET.

BY KENNETH FALCONER.

A difficulty frequently met with in seeking accurate costs is the proneness of both workmen and foremen to obtain the material they may require from any possible source of supply, and without regard to a proper charge being made for it. Particularly is this the case where some of the parts required for the manufacture of an article are made up on separate orders in large quantities for stock, possibly in the same shop as the machine for which they are required. In such case, if the storekeeper is unable to fill a requisition for such parts, and the workman requiring them sees on the bench beside him a large number being put through on another order, he is very

Date 11-5-03 Order No. P 7800

Take from above order—

4 pc #1—Machine KL 57

For use on Order No. K 5971

Sgd.

THE IRON TRADE REVIEW

FIG. 1.—THE BLUE TICKET.

likely to obtain what he needs and to neglect the charging thereof. If the storekeeper has held the requisition for future supply, this is likely to result in the parts asked for being sent up and a charge made after the order for which they were wanted has been completed.

The following plan was designed to meet and overcome this difficulty, and has been in satisfactory use for something over two years. It has resulted in more accurate cost records, in greatly lessened friction and claims for shortages between the shops and the stores department, and in saving time looking up records to see if certain parts known to have been used in the manufacture of a certain article had been charged out to the proper order number. In the case for which the plan was gotten up, the stores department is furnished with a specification of material necessary and parts required for each order, and is responsible for supplying the proper amount or quantity to the shops. The plan can equally as well be applied, however, where material is drawn from the stores by requisition,

		P7800
Feb	23	200 pc #1- for Machine KL57
Rec'd		Blue Tickets
20/3/03	25	11/5/3 for K5971 54
17/4/03	50	11/6/3 " 6982 50

THE IRON TRADE REVIEW

FIG. 2.—CARD INDEX OF ALL ORDERS FOR PARTS.

the principle simply being that when unable to supply the required parts an order (blue ticket) is issued authorizing the department or foreman known to have them to deliver what are necessary. The entry is made in the stores department, and the order thereafter accepted at its face value.

On receipt of an order or requisition calling for any parts which he is unable to supply, the storekeeper consults his records and obtains the number of the order on which such parts are being made. (The fact that there are none on hand is proof that an order is going through the shops for more). He then makes out a card, Fig. 1, locally known as a blue ticket, and makes a charge against the order for which the goods are required, exactly as though he had supplied the articles. This blue ticket is good in any department or shop for the number of parts for which it calls. These having been obtained from the workman or department in whose possession they were, the blue ticket is given in exchange for them, and is thereafter treated exactly as though it were the article or articles which it represents. It either remains with the balance of the order until completion or is sent to the stores department with the next delivery of such parts. It is accepted and receipted for by the storekeeper at its face value.

The stores department keeps a card index of all orders for parts, and on this card is noted all blue tickets issued against each order or delivery received on account of such order. A reference to this card, Fig. 2, shows at a glance how many are going through the shops, and how many of these are required for orders on hand. The difference, plus any in the stores, is the available supply. In the example given, assuming a new order issued for, say, 50 machines—K. L. 57—in looking up the required parts the storekeeper will see that in addition to what he may have on hand he can figure on using 21, which are being made up—this although he may know that a certain shop or department has in process of manufacture very many more than the new order will require.

The Hanging Rock Region.

IRONTON, O., Aug. 3.—The old plant of the Foster Stove Co. has been razed and a portion of the land sold to the Norfolk & Western for $25,000. The foundations for the enlarged foundries are being laid. The company sold under pressure, the N. & W. having prepared to condemn through their property.

A fine new laboratory and office is being erected by the Sarah Furnace Co. in this city.

All the steel and rod mills and finishing mills in this district, with the exception of the Eagle plant of the Republic Iron & Steel Co. are operating. The Republic officials announce through the local office that their plant is not to be abandoned, but will be started as soon as orders warrant a resumption.

The Ironton Disc Plow Co. has entered the market, castings being made at Chattanooga and assembled at the local plant. The company's foundry here will be in operation by Oct. 1.

It is reported that a general resignation of officers and directors of the Ashland Coal & Iron Co., Ashland, Ky., is contemplated, to give possession to Col. Robert Peebles, who is credited with having secured a controlling interest in the stock and given options to Rogers, Brown & Co.

The business heretofore carried on at Smith's Falls, Ont., under the name of the Smith's Falls Malleable Iron Works, Wm. H. Frost, proprietor, has been changed to a joint stock company, called the Smith's Falls Malleable Castings Co., Ltd., capital $150,000.00, composed of Wm. H. Frost, former proprietor, James Edwin Frost, former accountant, and others. The object is to enlarge and improve the plant. It is proposed to nearly double the present capacity of 4,000 tons a year.

Blast furnace D, of the Colorado Fuel & Iron Co., has gone out for repairs. The furnace was blown in last November and a number of accidents have occurred, resulting in the death of six workmen. The furnace will be thoroughly overhauled, and it is expected that it will not be in blast again before Sept. 10. Furnace A is being relined and the work is being pushed, but iron will not be made before Sept. 1. Only three furnaces, B, C and E, are working now.

The Chicago Crossing Co., formerly located at West Harvey, Ill., has completed its plant on Shields Ave., Chicago Heights, and begun manufacturing. The product consists of devices for holding rails and joints in frogs and crossings. The company also manufactures a base plate for rail joints, and is equipped for general machine shop work and repairing.

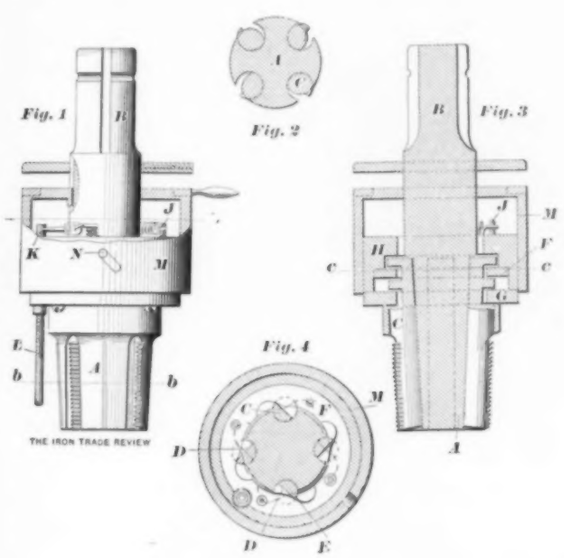
At the annual meeting of the stockholders of the Knoxville Iron Co., Knoxville, Tenn., all of the board of directors were re-elected. The directors elected the following officers: President, W. P. Chamberlain; vice president, T. J. Stephenson; secretary and treasurer, O. A. Brown.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

A Collapsing Tap.

Running a tap out of a hole by exactly the opposite process by which the threading was accomplished is one of the things to which exception is seldom taken. The process is so generally accepted as well established machine shop practice that any change in the method must have very good claims for adoption. Of course it is obvious that twisting the tap backward wears away the cutting edges when the actual thread cutting is supposed to be finished and consequently the after wear of the tap is just so much thrown away uselessly. The reversal of the machine calls for some complication in the mechanism but as this arrangement may be required for other work, that matter may really be of little practical consequence.

Inventors, however, seek for openings in this direction and P. J. Kelly, of Elizabeth, N. J., intimates that the devices he has recently patented are the fruit of many years' experience in tap making. He believes that they will take the place of solid taps over ¾-inch diameter. The illustrations show the means adopted in order to gain the objects sought. These comprise movable chasers or threaded cutters which may be placed positively and accurately in and out of the cutting position. The tap design includes reamers for sizing or as the specifications aver "for insuring a smooth edge to the threads formed by the



DETAILS OF COLLAPSING TAP.

chasers." Another feature of interest is in the means for automatically tripping the tap and withdrawing the chasers when the hole has been threaded to the desired depth.

Figs. 1 to 4 are submitted to show the characteristic mechanism of the design, Fig. 5 illustrates the tap as set for cutting threads and Fig. 6 has the cutters in a collapsed position when being withdrawn from a tapped hole. Figs. 5 and 6 do not, however, show the same tap at different positions; Fig. 5 is from a photograph of a tap with right hand chasers, and Fig. 6 shows a left hand tap. The action of the device is the same in principle for either direction of rotation. Fig. 1 represents a side elevation of the tap, a portion of the casing being broken away to more clearly show the parts within. Fig. 2 is a sectional view taken in the plane of the line bb in Fig. 1. Fig. 3 is a vertical section through the axis of the tap and Fig. 4 is a section along the line cc in Fig. 3. The body of the tap is at A and has the ordinary shank B for attachment to the machine. The lower portion of the tap body may be made cylindrical or tapered to suit different requirements, the tap seen in the illustrations having the lower portion tapered as for tapping pipe fittings and similar work. A series of chasers C is mounted along the tapered part of the tap A in sockets with their cutting teeth capable of being brought beyond the periphery of A when the chasers are partially rotated in one direction and to be brought within the periphery of the body when the chasers are partially rotated in the other direction. The upper end of each of the chasers C has two transverse notches D and E arranged at different angles to each other. There are two cam rings F and G attached permanently to the tap head H. The cam ring F having working surfaces to engage the bottom of the notches D in the chasers C, and the cam ring G having cam surfaces to engage the bottom of the notches E. These cam surfaces are so arranged with respect to each other that when the head H is turned in one direction around the body A of the tap, the chasers will be partly rotated out into their cutting position and when the head is partly rotated in the other direction the chasers will be rotated into their inoperative position. A spring has one end engaged with a pin carried by the shank B of the body and the other end of the spring is engaged with a pin J carried by the head H. The action of the spring is in a direction tending to rotate the head around the body and thus force the cam surfaces on the ring F to rotate the chasers C out of their operative position.

The head H and body of the tap A are locked together when the two are in such a relation that the cams have turned the chasers into a working position. This is accomplished by means of a rocking lever which has a locking dog K fitted to enter a socket in the head, the lever being hinged on a bearing carried by the body A. A spring exerts its tension in a direction tending to hold the locking dog K within the socket. A shallow groove is concentric with the body and leads from the

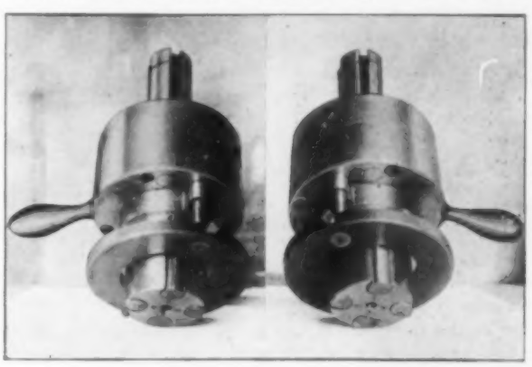


FIG. 5. FIG. 6.

COLLAPSING TAP IN DIFFERENT POSITIONS.

socket along the face of the head, the dog K traveling along the groove when released from the socket. The tripping device for automatically releasing the dog K and turning the chasers out of their cutting positions when the requisite depth has been threaded is designed as follows: A dog tripping bar has an upper opening to engage the dog and a lower member L having a threaded connection with the socket. The tripping bar is normally held at the limit of its downward movement by means of a spring and there is a feather and groove connection so as to prevent the turning of the upper member in the head when the part L is turned to adjust the pin. When the hole has been tapped out to the desired depth, the lower end of the pin will engage the surface of the metal and thus lift the dog K out of the socket. The spring then rotates the head in a direction to cause the cam plate F to swing the chasers C out of the threading position. The tap can then be withdrawn without the necessity of twisting it out of the hole.

The device for resetting the tap and threading another hole consists of a hollow casting M telescoping upon the head H. The wall of the casing has a diagonal slot engaging with a pin N projecting from the periphery of the head H. There is a feather and groove connection with the shank of the tap body and this ensures the positive rotation of the casing with respect to the body of the tap. The illustrations show the casing in the position which it assumes when the head H is locked to the body of the tap, the pin N in this position of the parts being located at the upper end of the diagonal slot in the cas-

ing and the latter being at the limit of its downward movement.

When the dog L is released from the socket, the partial rotation of the head H with respect to the body A under the tension of the spring will force the casing upward because of the pin and slot connection. When the tap is reset, the casing is forced downward by means of the handle, the head H is rotated and the dog K thus caused to travel along the groove until the pin engages the socket.

The body A of the tap is provided with reamers for sizing the hole as previously mentioned.

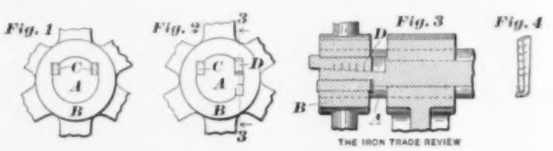
Keys and Keyseating.

A method of fastening pulleys and similar parts to shafting has been patented by Charles Hammen, of Chicago. Fig. 1 shows a section of a shaft with a wheel hub keyed in place according to the terms of the invention. Fig. 2 is a slightly modified construction also seen in section. Fig. 3 is a section along the line 3-3 in Fig. 2. Fig. 4 is a view of the preferred form of relief key.

The customary way of fitting keys of rectangular section counts upon two sides having a sliding fit, while the other two sides are wedged together or as the inventor puts it, "consisting of facing channels in the shaft and hub adapted to receive a key which is rectangular in cross section and has a slight taper in its dimension radial to the shaft, the channels having corresponding taper, the keys and channels, however, having their other sides parallel to the said radial dimension or with slight taper."

The leading feature of the present patent consists in giving such a form and location to the keys and keyways that each key shall be required to produce binding action only in one plane.

The shaft in the several views is indicated by A, and B is the hub of a wheel secured to the shaft. In Fig. 1 there are two keys C and these have taper in the one dimension only. Either



HOW TO KEY A HUB AND SHAFT TOGETHER.

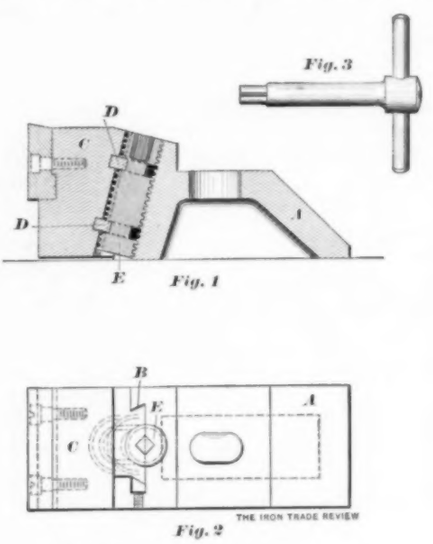
key would on being forced into the keyway tend to roll the shaft slightly in the bearing. This action is not contemplated, however, and is prevented by the opposing key which is placed symmetrically so that by driving the two keys simultaneously the shaft is firmly forced into the seat in the hub.

The inventor points out that in many situations requiring great security in the connection between shaft and wheel—as for example in fastening a propeller wheel to the shaft—it is often practically impossible to remove a wheel without rupturing the hub. A method of accomplishing this with comparative ease is claimed and illustrated in Figs. 2 and 3. In this form a relief key D is substituted for one of the keys C and has a taper in the opposite direction. The key D is lodged in the angular keyseats of the shaft and hub in the same manner as the key C. The taper, however, is very much greater than would be desirable for a key tightened in the usual manner—instead of having a taper of about one-eighth of an inch to the foot, the key D may have a taper of three or four times that amount. This key has a head at the outer end so that it will not move endwise and slacken the grip on the shaft. The key D is lodged in position and the wheel put on the shaft and the subsequent tightening of the key C binds the relief key D.

When the keys must be withdrawn from the shaft and the wheel removed, the head of the key D is cut off and that key can be driven in, the greater taper rendering this course feasible. A third key may be added in the case of some large shafts as in Fig. 3. This additional key will be located about opposite the key C and will be seated so as to crowd in the same circumferential direction and not in the opposite direction as in the case of the two keys in Fig. 1. This key will be tightened first and the key C being last tightened will seat the hub firmly against the shaft at the side opposite the chord in which the seats of the keys C and D are located. When the wheel is located near the bearing so that the key can be driven only a short distance it will be necessary to cut it away in pieces as it is driven through and in order to do this the key may be made as shown in Figs. 3 and 4, cut partly in two by slits at intervals not greater than the distance which the key can be driven before striking the bearing. The key being first driven in this distance will be cut off at the first slit and so on. It is practicable to combine a relief key, such as the key D, with two opposed keys both of which are to be driven as in the first construction described.

Machine Tool Vise.

This is intended for use on shapers, slotting, drilling and other machine shop tools and has been patented by Johannes Hubner, of Hermsdorf, Germany. The patentee undertakes "to provide a clamping means which will securely clamp the work piece" and this sure thing contrivance is illustrated as follows: Fig. 1 represents a sectional elevation, Fig. 2 is a plan view of the device and Fig. 3 is the operating key or wrench. A cast iron block A is hollowed out on the underside and has a slot for the bolt to fasten the device in place on the machine tool table. The cast iron block is planed off on an incline at one end as at B and dovetailed. Into this dovetailed end fits a corresponding jaw C with an attached gripping face. A hole is bored parallel to the dovetail slant and having the axis on the center line of the meeting surfaces of the two blocks A and C. The half round face of the block A has a semicircular rack and the corresponding face of the jaw C has



A MACHINE TOOL VISE FROM GERMANY.

two curved ribs D. A screw E has a thread to fit the semicircular rack on the block A and has two grooves to receive the ribs D. There is a square opening at the end of the screw for the wrench shown in Fig. 3.

When the parts are assembled the wrench is inserted into the screw and the jaw C raised or lowered and at the same time moved horizontally toward or from a given point. It is expected that two of these devices will be used in combination and will be arranged on the machine bed to form a vise.

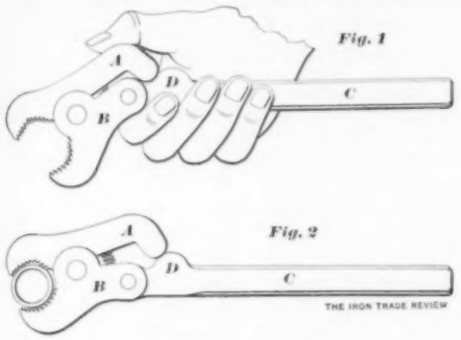
The gist of the patent is in the wedging arrangement of the jaw and on this head the inventor says: "I have found that a suitable relation of horizontal to vertical movement is as one to three—i. e., to each unit of horizontal movement three units of vertical movement are consumed. The force pressing down the work piece clamped between such a device and a rigid rest or between two such devices, owing to the combined movements is relatively very great and a lifting of the clamped object is practically impossible.

Back to the Pipe Tongs.

Most of the designers of new wrenches, either of pipe or monkey wrench variety, travel along the path which leads to sliding jaws, the variations coming in the clamping of the movable jaw, and there are countless forms of these combinations. There are many good reasons, no doubt, for this design habit and the sliding jaw has a certainty of setting which is desirable enough on nuts and screw bolts but is

not so suitable on piping and there is more latitude in the design of wrenches for gripping round work.

A recent invention of this class goes back to the tong type of design and has been patented by Frank D. Bullard of Los Angeles, Cal.. Fig. 1 is an elevation of the wrench as it is gripped by the hand and ready for placing on a pipe. Fig. 2 shows the wrench as applied to a section of pipe. The two



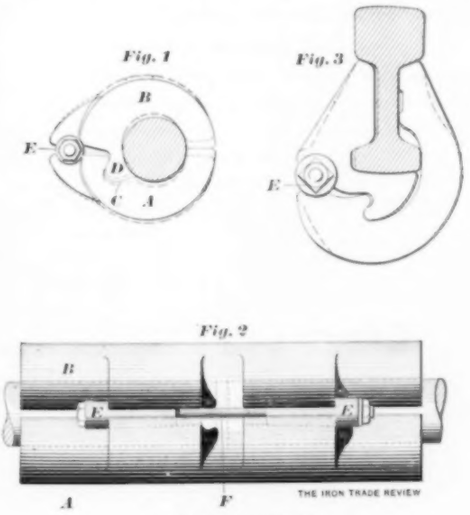
IMPROVING THE PIPE TONGS.

curved jaws have the usual teeth on the adjacent surfaces and terminate in shanks A and B, one of which is shorter than the other. These jaws are pivoted together by a riveted bolt and the shanks are pressed apart by a spring. The ends of the spring are inserted in recesses in the jaws and normally the jaws are closed by the pressure. The free end of the shank on the longer jaw is bent inward so as to extend around and close to the rear of the shorter shank and will the more quickly come in contact with the lever C, which is pivoted to the shorter shank B, by the riveted bolt, than if the shank were straight or sloped off in the other direction. The end of the shank where it comes in contact with the lever is rounded. The handle has a rounded projection on the face which comes in contact with the shank A when the wrench is in use on a pipe and the speed of the action is greater than it would be if the lever were straight.

The wrench will work upon a number of different sizes of pipe and requires no adjustment of parts other than the automatic action resulting from the construction. The lever is pivoted closely to the end of the longer shank and gets thereby a strong bite on the pipe.

Coupling Shafts and Bars.

The inventor, Charles A. A. Chenu of Etampes, France, has a device for coupling bars of any cross sectional form. Figs. 1 and 2 illustrate in end and side elevation the first form, rep-



A SIMPLE COUPLING.

resented by a coupling sleeve for shafting; and Fig. 3 shows an end elevation of the device as adapted for coupling rails.

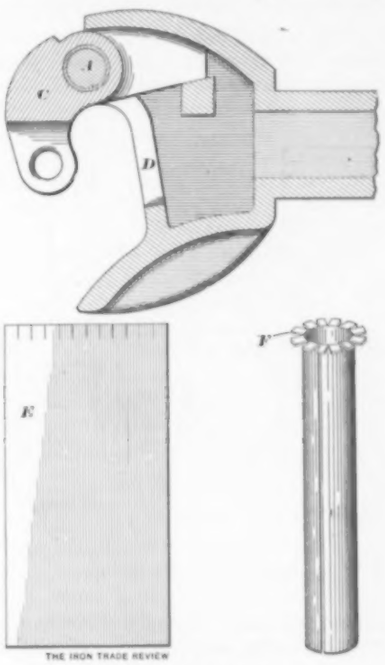
The coupling in Figs. 1 and 2 consists of two shells, A and B, which form the clamps surrounding the two ends of the bars to be connected. One of the shells—A, for instance—has a groove C, which engages a rib D, on the other shell B. The parts C and D constitute a hinge which allows the jaws A and B to open and shut as may be seen by the dotted lines in Fig. 1. The groove C and the rib D are of semicircular cross section in order to allow this movement. At the same time C and D together form a sort of hook uniting A and B and when the free ends of the two jaws are pressed one against the other to encircle the ends of the shafts the parts lock together to support the confining pressure.

Each shell A and B has near the joint and opposite to the jaws, one or more projections and the pairs have their internal surfaces coned out for a wedge or cone shaped piece E. A bolt F with nut and washer can be used to keep the wedge F from getting loose. Evidently the position of the wedges will tighten up the jaws A and B on the shafts.

Fig. 3 shows a similar arrangement as applied to fastening rails. In this case the coupling does not encircle the bars but the free ends of the jaws are tightly engaged with the opposite sides of the rails. The coupling is, however, essentially the same in other respects as the device shown in Figs. 1 and 2.

An Old Expedient in a New Light.

Compensating for wear is the inevitable among machinery. The wear of use or abuse, oftimes both, must be corrected if the best results are to be had from any machine. Devices of



A PATENTABLE "SHIM".

all kinds are encountered and the ingenuity of the designer has brought out many forms of a widely varying adaptability and usefulness. The use of a "shim" as it is known to the adept in shop practice or as it may be explained to others—a thin piece of metal placed between two parts to make a fit—is so well understood for this purpose that it would seem impracticable to obtain a patent upon any form of wear-compensating device of this type. The scheme appears to be among the most elementary of the forms the mechanic may select and the rolling of a piece of sheet metal into shape so that it could be placed on a worn stud is reminiscent of the old-time machine shop of the cross roads rather than a candidate for the honors of Government protection on the score of novelty.

Be that as it may, Le Grand Parish, of Chicago, has a patent of recent date which has reference to "devices designed for use in taking up wear, such as occurs where pivot pins are used in conjunction with relatively movable parts held by such pins." He takes for an example the knuckles of a standard form of car coupler and this is illustrated in plan section in Fig. 1 with the invention applied. Fig. 2 is a blank piece of metal for making one of the compensating devices, and Fig. 3 shows the device in a completed form and ready for use.

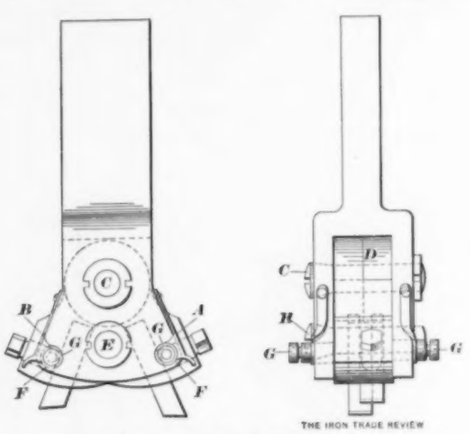
The pin A fits in the coupler head D and holds the knuckle C in place. Both the pin A and the opening through the knuckle C are subject to considerable wear and the inventor

remedies this fault by taking a piece of sheet metal E, notching or slitting one of the ends and rolling the blank into cylindrical form as in Fig. 3. The flange F being formed on the top of the body portion in order to form a head for the compensating device.

The inventor places the metal cylinder around the pin A and intimates that by leaving the meeting edges free the shell may have a certain amount of resiliency so that it will not require to be an accurate fit and if sprung into place will be securely held in position. He also reminds the reader that by taking sheet metal of different thicknesses, different sizes of compensating devices may be made without material additional expense and, finally, avers that by this improvement he is "enabled to secure a wear compensating device of a soft or hard ductile metal as may be preferred, and one which while very thin will yet at the same time be of uniform thickness throughout its body portion or shank." All of which is not suggestive of a high degree of novelty from the shop standpoint albeit the Patent Office has sanctioned the claim for "The combination with a pin and socket joint of a wear compensating device formed of a removable cylinder of sheet metal rolled into form with the meeting edges thereof unconnected and provided with means to hold it in place, substantially as described."

Roughing and Finishing Tools Combined.

This contrivance is designed for a combined roughing and finishing tool for planers or shapers, a rough cut being given the material in the forward movement and a finishing cut following. The device has been patented by Axel Ryden of Chi-



DOUBLE ACTING PLANER TOOL.

cago and an elevation of the tool and a side view are shown.

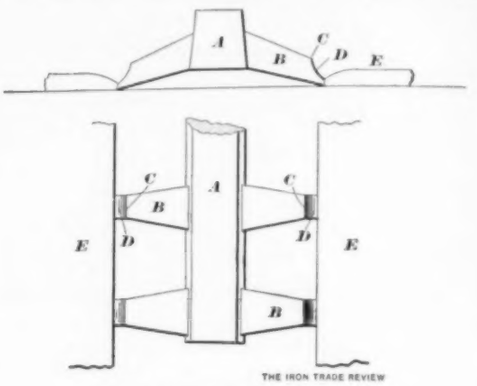
The frame of the device comprises a shank to fit in the usual post on the apron of the planer or shaper head and the lower end has a fork for the tool holders. The tool holders A and B are pivoted on the bolt C which is located in the upper part of the forks of the frame and fits in an opening D. The tool holders A and B are counterparts of each other and have their upper portions cut away to fit, half of the one being circular to fit into a suitable recess in the other. The meeting edges of the tool holders A and B have circular recesses to rest against the bolt E which braces the members when the tools are cutting.

The cutters, as may be seen in the side view to the right, are not in alignment with each other so that the cut made by the roughing tool will be in advance of the cut made by the finishing cutter. Each of the tool holders has the usual set screw for adjustment and renewal of the cutters. There is a spring which has arms F connecting with grooves in the pins G. These pins G are normally held out of engagement with the tool holders A and B by means of the springs but when one of the tool holders is to be raised or prevented from cutting, the arms F of the spring are withdrawn so that the pin G may be pushed into the forked piece and project on the inner side to engage the edge of the tool holder. The ends of the spring are again employed for locking the pin in the inner position.

A Pattern Proposition.

Gate patterns must be large enough for the free flow of the molten metal to the mold and at the juncture with the pattern proper must be thin in order that the surplus metal may be easily broken off the casting with as little injury as possible. How large the one or how thin the other is not now so important but in practice the two influences account for a sharp change in contour where the one part of the pattern runs into the other. A simple method of forming this connection is submitted in the patent granted Fred H. Arnold of Reading, Pa.

The engraving shows an end view and a plan of a pattern



A KINK FOR THE PATTERN MAKER.

gate for which much is claimed in the way of screening dross and dirt from the molten metal. The main gate pattern is seen at A and this part of the pattern may be at any desired shape and has a number of feeders B which extend from the sides of the main gate pattern above the base. These feeders B are formed at a slight downward angle from the point of connection to the main portion A with the intention of insuring a free flow of the metal down the inclined portions to all parts of the mold. The feeders B are tapered toward their outer ends and the outer corner of the upper face of each pattern is removed to form a shoulder C. The end is curved from this shoulder as shown at D, in an oblique direction toward the lower and outer extremity making a reduced section on joining the main pattern at E. The corner C checks the flow of the upper portion of the stream of metal and catches the dross and the curved end D "will insure the easy flow of the metal which being cleaned of all dross and foreign substance is practically a pure metal and will not only flow freely but will pass from the gates in a fine stream and thus permit a much thinner casting than would otherwise be possible." The inventor suggests that the plan is capable of ready application; a little wax, solder or wood affixed at the critical point is all that is essential. The metal chokes at C and D and the dirt will rise and hug the shoulder C while the clean metal is hustled into the mold. All of which is very desirable "as described."

Continuous Lubrication.

A bearing, Figs. 1 and 2, is the subject of an English patent received by Henry A. Mavor, of Glasgow, and is illustrated in the *Mechanical Engineer*. It is arranged as follows: A sleeve

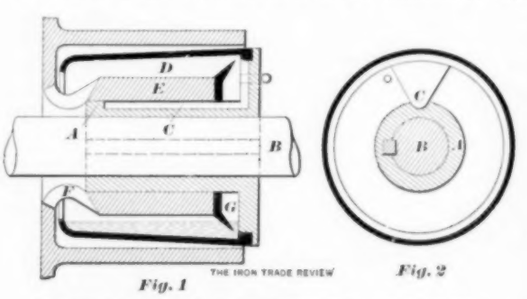


Fig. 1 *Fig. 2*

AN ENGLISH SCHEME FOR CONTINUOUS LUBRICATION.

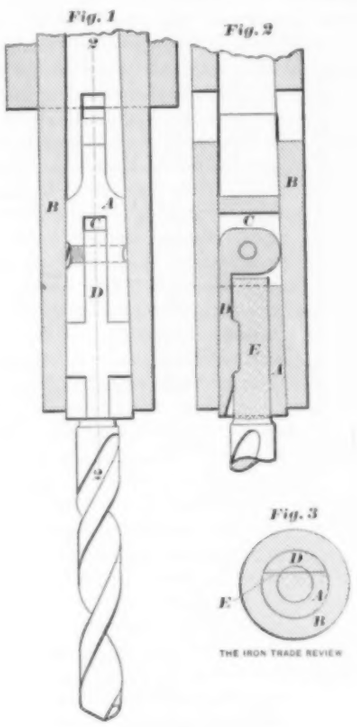
A is keyed upon a shaft B and has a flange at the outer end with an oil groove C in the inner side of the flange and the upper part of the sleeve A. An oil chamber D surrounds the bearing A and is fastened to the outer portion of the flange. A hub E runs on the bearing and is connected to a plate and U-shaped casting F having an outer diameter less than that of the hub E. The outer diameter of the hub is the same as the contracted inner end of the oil chamber D through which it passes. The U-shaped connection at F has openings so that the

oil working between the sleeve A and the hub E will be thrown by centrifugal force into the oil chamber D when the hub is rotating, or drain through when the device is at rest. The flange G acts as an oil thrower and is a ring fastened to the outer end of the hub E with a conical part having the larger end close to the oil chamber and the outer end of the oil groove formed in the flange and the bearing A. The outer end of the oil groove in the inner side of the flange is as shown in Fig. 2, flared, the inner end being the smaller in cross section.

Getting a Grip on Drill Shanks.

Joseph A. Coburn of Norwood, Mass. has brought out a device for holding drills, milling and tapping tools, etc., and Fig. 1 is an elevation of his invention. Fig. 2 represents a section on line 2-2 of Fig. 1 and Fig. 3 shows a cross section of Fig. 1.

The drill A fits in a chuck which in turn is adapted for insertion in a sleeve B, the latter in the present case being an ordinary drill press spindle. The chuck is provided with a slot which communicates with the socket for the drill shank and is extended at one end as at C. There is a finger D which is pivoted to the chuck and inside the slot C. The finger D has a projection extending into the socket of the chuck and engaging a recess E formed in the shank of the drill A. This recess E has a beveled face and when the projection enters the socket it strikes the incline and in case the shank has not been fully inserted in the socket the contact will force the shank into place.



ANOTHER DRILL GRIP.

The finger D is cam shaped near the pivot so that when swung out pressure is brought to bear on the end of the drill shank to force it away from the seat. The bore of the spindle B and the outer surface of the chuck and the finger D are tapered to fit and this engagement of the parts forces a close contact of the tool shank with the projection on the inside of the finger D, etc.

The Pittsburg Steel Foundry, Glassport, Pa., last week cast a field disc weighing 102,000 pounds. It was a steel casting and was made in five days, which establishes a new record for a casting of this kind. The casting was shipped to England on an order from the British Westinghouse Co.

The Flum Foundry Co., one of the new industries of Hamilton, O., was put in operation a few days ago. It will employ 50 men.

TRADE PUBLICATIONS.

A leaflet issued by Henry Pels & Co., 68 Broad St., New York, is designed to answer question how to cut structural material. This firm manufactures the Werner portable beam shear, operated by hand and the Johns patent power beam shear. The cutting records of both are given—the former being adapted to use in beam yards and other places where no power is obtainable and the latter for rolling mills, bridge works, structural works and shipyards.

The latest leaflet of the Vulcan Iron Works Co., of Toledo, O., has in compact shape illustrations of the various forms of service in which the "Giant" steam shovels are employed. The "Little Giant" 26-ton traction wheel shovel is shown excavating ore in a Mesabi range open-pit mine.

The catalogue of the Harbison-Walker Co., of Pittsburg, is an elaborate affair, printed in colors and bound in red flexible leather with flap. The pages have gilt edges and the lettering on cover is in similar style. There are many illustrations of the various kinds of fire brick, sectional views of the different stoves for blast furnace service, tables of fire brick proportions and quantities for arches and circles and tables of temperatures, etc.

"A Brief History and Description of the Art of Steel Casting" is a pamphlet with a number of halftones of the product and plants of the National Steel Foundry Co., and more particularly the foundry at New Haven, Conn. Steel castings of large dimensions are shown and there are views of the foundry interior.

A convention souvenir of the Master Mechanics' Association and the Master Car Builders' Association meeting at Saratoga, is the pocket list of railroad officials prepared by the Railway Equipment & Publication Co., of New York and Chicago. The list of names is compactly arranged by departments and alphabetically and will be found very useful.

Bulletin No. 6 of the University of Texas mineral survey is entitled "The Mining Laws of Texas." It is the sixth in a series of publications designed to further the mineral industry within the State. The work contains tables of magnetic declination as well as an address on the Texas mineral lands and the mining law delivered before the International Mining Association in El Paso. The volume has been compiled under the supervision of Wm. B. Phillips, director of the mineral survey.

The New Castle Forge & Bolt Co., New Castle, Pa., is making additions to its plant which will increase the present capacity three times. A bolt, rivet and nut department is being added, 342x80 feet, and the present main building was increased in size by an addition, 112x60 feet. A gas producer plant containing five producers has been added which will provide gas for all of the furnaces in the plant. The producers were built by the American Furnace Co., of Pittsburg. The power plant is being increased by the installation of two 250-h. p. boilers, the present capacity of the plant being 160-h. p. The Erie City Engine Co. is installing one 125 and one 225-h. p. engines direct connected to Westinghouse generators. The new machinery that will be installed consists of three bulldozers, nine presses, nine hammers from 800 to 2,000 pounds capacity, five nut machines for making nuts from ½ to 2 inches, ten bolt machines for making bolts from ⅜ to 3 inches and five additional rivet machines for the manufacture of boiler and structural rivets. An addition 30x80 feet has been built to the machine shop and a number of lathes, planers and milling machines have been added.

Mugler's Iron Works, 420 East 108th St., New York, was recently incorporated to manufacture vestibule doors, elevator cars, bank and office railings, grates, iron stairs, fire escapes and other specialties.

The Southern Car & Foundry Co. was declared bankrupt at Trenton, N. J., July 28, which was the return day on the bankruptcy proceedings instituted by the Standard Steel Car Co., of Pittsburg. No defense was put in.

HEATING AND VENTILATING THE MACHINE SHOP.*

J. I. LYLE, M. E.

I very vividly remember, while serving my apprenticeship as a machinist in a railroad shop, that the temperature in the shop often dropped below 40 degrees and frequently to freezing if the outside weather was within 15 degrees of zero. With a temperature of 40 degrees a workman's hands become numb, and it is almost impossible to do good work with hand tools. This shop was considered by those in charge as being amply heated with an overhead direct steam system. The employes, instead of working to keep warm, as a rule chose to loaf to keep warm, and I do not believe that the amount of work produced on such cold days, when estimated very conservatively, amounted to more than 75 to 80 percent of the normal output. In this building there were about 150 employes earning approximately $2.50 per day; considering, however, the output to be 85 percent, the loss on cold days amounted to something like $37.50.

An efficient heating plant for this shop would cost about $3,750 complete. Without considering the cost of steam, of which there was plenty of exhaust going to waste; and allowing for depreciation, etc., we get a liberal total of 12 percent or $450 per year as the amount that the cost of the heating plant should earn. It would take only twelve days with the thermometer below 15 degrees above zero to make the expenditure a paying investment.

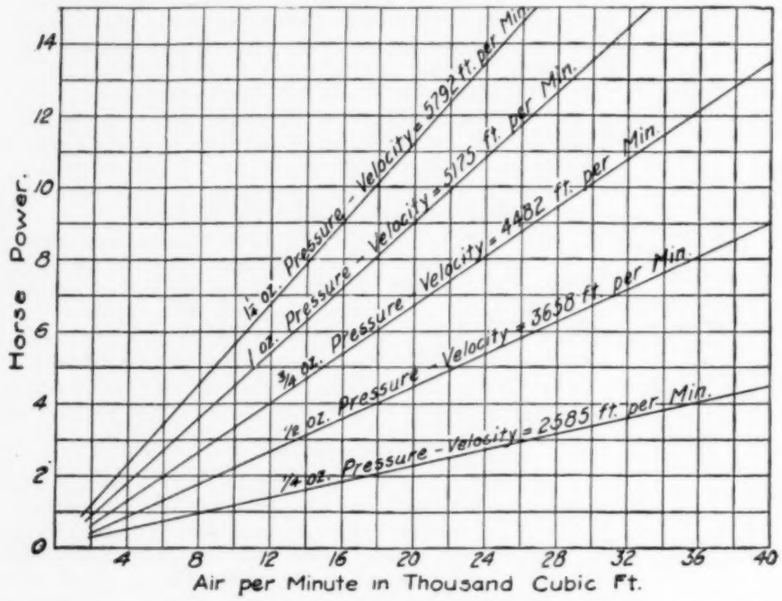


DIAGRAM SHOWING HORSE POWER REQUIRED TO MOVE A GIVEN VOLUME OF AIR AT GIVEN VELOCITIES OR PRESSURES.

Practically all railroad shops have exhaust steam from the shop and electric lighting engines and air compressors which is available for heating, so any system not adapted to the economical use of exhaust steam should not receive serious consideration. In considering the advisability of utilizing exhaust steam and returning the water of condensation to boilers the questions of back pressure and cylinder oil carried over with the steam should not be overlooked.

Regarding the question of back pressure and the minimum required for the various systems of heating, it will be found that ordinarily five pounds is carried, and while this could be reduced in moderate weather, the general practice is to establish this as the minimum and increase the pressure in extremely cold weather. With a carefully designed plant, however, this is higher than should be necessary unless there are some adverse conditions. The minimum pressure required for circulation depends more upon a proper proportioning of the supply main, and the distributing branches, than upon the return main. The question of expansion of the steam and the proper removal of the condensation at the required points in the supply main should receive careful consideration. A great many plants require a higher pressure to secure circulation than would otherwise be necessary had proper consideration been given to the dripping of the mains and its branches. Wherever possible, the use of traps in return lines should be avoided as a pump and receiver or boiler feed pump controlled by a pump governor makes the best kind of trap.

The three systems adapted to the use of exhaust steam are: First. Direct steam heat, consisting of pipe coils placed along the walls or overhead. Second. Direct hot water where the exhaust steam is used in some form of feed water heater to heat the water which is circulated either by gravity or a force pump through the direct coils in the building. Third. The fan system, where steam coils consisting of wrought iron pipe are placed in one or more groups and air drawn over these coils by a fan and forced into the building.

Direct Steam or Hot Water.

The sole advantage of direct steam for shops is its extreme simplicity, requiring for its operation the opening and closing of a few valves. This feature is a good one, but it is offset by the disadvantages of having the heating surface distributed through the shop where it is always subject to damage from many sources. Very often it is difficult to place the coils for proper drainage.

With the installation of overhead cranes in shops covering considerable area, and especially those provided with a monitor type of roof, it becomes a difficult problem to install a direct system of either steam or hot water, and an installation of this type frequently requires changes in shafting and machinery to make room for the required amount of heating surface. As a rule, a great deal of glass surface with its high condensing influences requires a large amount of coil surface that cannot be completely installed satisfactorily below windows and between door openings. Coils overhead do not secure an equal distribution of heat satisfactorily, and while the fan-like effect is obtained from the pulleys and belts when the plant is in operation, during the time the plant is idle the bulk of hte heat is where it is least required. Often to secure a perfect circulating system it becomes necessary to install a considerable amount of trenching. Trenching, as far as practicable, should be eliminated from shops, as it becomes a pocket for the collection of dust, waste, water from leaks, etc.

Direct hot water lays claim to the advantages in comparative simplicity and control of the temperature, but on the other side of the balance sheet it has the same disadvantages of having the heating surface spread throughout the shop subject to injury. The fan system has the advantages of having all the heating surface assembled in one place. Nearly all the heating surface can be set vertically, thereby procuring perfect drainage. The warm air being forced into the building, a constant circulation of the air is maintained, thus heating all portions of the building more evenly than any other system. Because of this forced circulation there is less difference between the temperature of the air near the floor and that near the roof, than when natural circulation is used. Its disadvantages are in having a fan and engine or motor to be cared for, and in having large hot air pipes placed overhead.

The fans installed in the various railroad shops differ very materially in their design. Two types of fans are used for heating; the disc or propeller type, and the centrifugal or steel plate type. The latter is used almost exclusively, as the disc fans, except for very small installations, have not been a success. With the centrifugal type of fan, the most economical results for heating are obtained when running the fan in coldest weather at a speed so the periphery of the wheel will travel at a velocity of approximately 4,500 to 5,200 feet per minute. In no part of a fan system design does practice differ so greatly as in construction and location of the hot air ducts. Several schemes are used, the most common being to construct the ducts of galvanized iron and to carry the horizontal runs overhead through the truss work, with warm air outlets

*Read before the New York Railroad Club, March 20, 1903.

spaced from 15 to 40 feet apart, these outlets being placed from 8 to 20 feet above the floor.

The Fan System.

In the early installations the idea was to distribute very thoroughly, through ducts running practically all over the shop, a relatively small volume at a high temperature and to discharge it 6 feet or 8 feet above the floor and direct it so it would blow on the workmen. This practice resulted in much adverse criticism of the fan system, as the workmen in the line of the discharge were given colds and would be overheated, while those not in the direct path would not be heated sufficiently. The later practice for large shops has been to use large volumes of air at rather low temperatures and to use much shorter pipes and allow the air to travel free in the building for some distance. The outlets are usually from 10 feet to 20 feet above the floor. In this design advantage is taken of the fact that the warm air discharged high up travels toward the walls where it is cooled and becoming heavier falls to the floor, thus the walls assist the circulation. The direction of the winds largely determines the coldest side of a building and as the temperature of the wall will control to a certain extent the air currents, the coldest wall will cool the greatest amount of air; consequently the more air will be drawn in that direction. With the older installations of thorough distribution this was not accomplished so well and generally one side of the shop would be better heated than the other. Another advantage in placing the outlets high is that no air currents are felt by the occupants on the floor. Heating plants in machine shops are in successful operation now where the air is discharged 100 to 175 feet from the ends of the buildings, and in foundries it is blown as far as 250 feet.

Masonry or concrete ducts placed under the floor with standpipes placed at intervals and extending above the floor 8 to 12 feet are in many cases used. In the Brown Hoisting Machinery Co.'s Cleveland shops, the underground concrete duct is used and connected to the hollow steel columns supporting the building, which are used for the risers, discharging the air about 4 feet above the floor. In the Philadelphia & Reading shops, at Reading, Pa., no distributing pipes are used, but the hot air is discharged from the fan into the building overhead and the air returned to the apparatus by means of underground ducts with openings at the floor line and distributed through the shop.

The velocities of the hot air in the main ducts leading from the fans should never be greater than 2,500 feet per minute, and this velocity should be reduced gradually in the different branches so that the air is discharged from the outlets at from 800 to 1,200 feet per minute. Where the outlets are high, as in large buildings, 1,200 feet per minute can be used without any objectionable results; but where a thorough distribution is desired, and the outlets are placed within 6 or 8 feet from the floor, the velocity of air from the outlets should not be greater than 800 feet per minute.

In any shop installation, provision should be made for re-circulating the air, also for the use of cold, fresh air from the outside of the building. Occasionally it is found that a building can be heated easier by using part outside air and part return air than to use all return air. This is accounted for in the following way: Where the fan is blowing into and exhausting from the building as in re-circulating, the pressure maintained in the building is not greater than the outside, so the leakage of air around windows, doors and crevices may be very great, while by the use of a part fresh outside air a slight pressure can be maintained and to a large extent prevent this inward leakage. In either case cold air will, of course, be entering the building, but in the latter case the outside air will pass through the heater where it can be heated more economically and easier than by mixing it with the heated air in the building as it leaks in. In some cases it is found difficult to maintain uniform temperature throughout the buildings when using entirely return air, because it is difficult to keep the lower strata of air along the floor sufficiently warm, owing to leakage, though in the upper part of the building the temperature may be as high as 80 or 85 degrees.

Capacity of Exhaust Fans.

Because of the influence of local conditions, fan makers hesitate to give out data about their apparatus. The capacity of the steel plate centrifugal exhaust fan (inlet on one side only) when running under "free delivery" will be given approximately, however, by the formula: $C = 1.57\ D^2WR$.

In which C = capacity in cubic feet per minute. D = diameter of the blast wheel in feet. W = width of the blast wheel at the periphery in feet. R = r. p. m.

By "free delivery" is meant to set the fan in the room and simply draw the air into the inlet and discharge into the same room without any piping, thereby avoiding ducts with the attending friction, other than the air passing through the fan.

In factory buildings, where short pipes of rather large diameter are used, thus reducing the friction, the formula, $C = 1.25\ D^2WR$, will be found to be approximately correct. With long ducts terminating into many small outlets, the capacity will reduce from 10 percent to 20 percent as given by this last formula.

The delivery or capacity of a fan within the limits used in heating, varies directly as the speed of the fan. In a good installation with the fan running with a peripheral velocity of 5,200 feet per minute (approximately one ounce pressure with air at 62 degrees) from 2,200 to 2,500 cubic feet of air per minute will be delivered per horsepower expended.

By proportioning the fan to meet the severest conditions, of weather say, zero or colder, then in moderate weather of 20 degrees to 25 degrees above zero the fan will do the work easily at three-fourths the speed; the delivery varying with the speed and the horsepower will be reduced more than one-half, giving 3,850 to 4,300 cubic feet of air delivered per minute per horsepower. As the number of zero days during the winter are comparatively few, it will be found in the majority of cases that the cost of power to run the fans on such days at one ounce pressure is less than the interest on the increased cost of a larger fan designed to operate at a slower speed in the severest weather.

Steam Engine or Motor Drive.

As to whether a steam engine or electric motor is the better for driving the fan depends upon the local conditions. If there is not sufficient exhaust steam to do the heating, an engine driven fan is the more economical as its exhaust can be used. Fully 75 percent of the heat of the steam supplied to the engine is available for heating, as the cylinder condensation and expansion will not amount to more than 25 percent. An engine driven fan also has the additional advantage of being independent of the electric plant; so the heating plant can be operated when the electric plant is shut down. Where electric current is constantly available together with sufficient exhaust steam, an electric motor is the most convenient and economical, as it is probable the electric generating units in such cases are large and consequently more economical than a small steam engine. If the fan apparatus is placed very far from the source of steam supply, the condensation in high pressure steam pipes necessary for an engine is an item well worth saving. Where engines are used it is preferable to have them direct connected, but belted electric motors are preferable because of the large and expensive motor necessary for direct connection on account of the slow speed of the fan. The diagram shows the horsepower required to move a given volume of air at different velocities or pressures.

The semi-annual report of the Republic Iron and Steel Co., covering its operations from Jan. 1 to June 30, will be issued this week. It is stated officially that the figures in the coming statement will be practically the same as those in the statement covering the last half of 1902. The surplus after the payment of dividends will probably not vary more than $10,000 to $15,000. The second half of 1902 produced a surplus of $671,631 after paying the preferred stock dividend. Allowing $650,000 as the surplus for the six months ended June 30, makes the surplus for the fiscal year $1,321,631, or nearly 5 percent on the common stock. The company's balance of surplus Dec. 31, 1902, was $2,606,020. The addition of the surplus earned in the half year ended with June will raise the total to about $3,256,000. This figures practically 12 percent on the common stock, which is now selling in the market around $12 a share.

The Conrad Motor Carriage Co., Buffalo, has gone into the hands of a receiver on petition for dissolution. Nominal assets are $40,000 and nominal liabilities $100,000.

Cincinnati Machinery Market.

CINCINNATI, Aug. 4.—The feeling in the machinery trade is quite cheerful. All local manufacturers are in active operation with a nice run of orders ahead. While the shops are to some extent catching up on deliveries and there is not that rush of business that characterized the conditions a few months back, there is a good steady volume coming along all the time which puts the manufacturer in position to furnish more satisfactory deliveries and relieves him of the annoyance of constant complaint and urgent demand for shipments. The number of orders pending and the actual business in sight gives the situation a better appearance than a month ago. Foreign business is still unimportant as to volume, but an occasional order is coming in. Considering that this is the midsummer season and that so many of the important figures in large business enterprises are away the demand for machinery and machine tools is large enough to make it clear that the manufacturers of the country are so busy that orders for additional machines can not be deferred until fall. The decline in values in Wall Street has not had any perceptible effect on the machinery interests and it is evident that the factors responsible for the present condition of the speculative market for securities have not affected manufacturing and other legitimate enterprises.

Schumacher & Boye report conditions very satisfactory and are looking forward to the time when they can move part of their plant into their new building which is under construction. They will install some new machines in this new building and arrange to relieve the present shop of the manufacture of certain parts of their lathes entirely. Though large their shop is crowded and is working up to full capacity.

The Cincinnati Milling Machine Co. reports trade steady with a strong undertone. The latter part of July brought in a nice run of orders and Eastern agents are ordering with a strong display of confidence. The outlook for fall business is good and there is nothing in sight to disturb the present satisfactory conditions.

The Dreses Machine Tool Co. makes a specialty of looking after foreign trade as well as domestic. The company has received some nice orders from England and Scandinavia, but reports little or nothing from Germany or Russia. The general depressed conditions in Germany and the high Russian tariff are believed to be responsible for the lack of business from these two countries. In a general way the company finds trade satisfactory and normal and the outlook encouraging.

Greaves, Klusman & Co. have nothing to report except a continued satisfactory demand for their machines of a well distributed character, and without anything in sight to disturb the situation they are quite comfortable.

The Cincinnati Planer Co. has had an excellent month and has a nice run of orders in hand. The company has booked more business in July than in any month since March, when the demand was very heavy. Among the orders taken this month are a 60-inch planer for the Carnegie Steel Co., a 42-inch planer for the Pennsylvania Railroad at Philadelphia, a 60-inch planer for the Coffin Valve Co., of Boston, one 42-inch and one 26-inch planer for the Morton Manufacturing Co., of Muskegon, Mich. The month was highly satisfactory both as to shipments and orders and the company has plenty of inquiries, showing that there is business pending.

The McIlvaine & Spiegel Boiler & Tank Co. has a big run of orders to fill and reports the demand as very heavy. Among orders received are the boilers and cookers for the new commercial Distillery at Terre Haute, Ind., the gas tanks for the United States Gas Co. plant, now being built at Duluth, Minn., nine large marine boilers, and two large boilers for S. F. Bowser & Co., of Ft. Wayne, Ind. The latter order calls for internally fired boilers 96 inches in diameter and 16 feet long.

The strike of the boiler makers was settled last week on a compromise basis and an agreement was entered into by the men to arbitrate all future differences.

The Bickford Drill & Tool Co. reports demand satisfactory and business good. The plant is working up to capacity to take care of orders.

The machinery exhibit at the Fall Festival at Cincinnati this year will probably be the best and largest exhibit of the kind ever displayed in this city. The floor space in machinery hall is practically all taken. The machines will be displayed in operation, power being furnished by motors. The Barriett Electric Co. and the Triumph Electric Co. have arranged to furnish the motors necessary. Among the firms who have secured space in machinery hall are the following: Lane & Bodley, the Marmet Co., the Warner Elevator Mfg. Co., the Watkins Mfg. Co., the Lodge & Shipley Machine Tool Co., the Cincinnati Tool Co., the Cincinnati Milling Machine Co., the Cincinnati Planer Co., the Cincinnati Shaper Co., Bickford Drill and Tool Co., White Star Laundry Co., Ritter Electric Co., Jantz & Leist Electric Co., Standard Oil Co., Queen City Supply Co., J. A. Fay & Egan Co., the Standard Optical Co., John H. McGowan Co., E. W. Nickerson, E. A. Kinsey Co., Fosdick Machine Tool Co., Bradford Machine Tool Co., German-Russell Co., Union Heat and Light Co., Barriett Electric Co., and the Cincinnati Punch & Shear Co.

The Russian Government has just placed an order with the American Laundry and Machine Co. for two car loads of machinery to fit up a modern laundry plant in one of the government institutions at Odessa.

The Bullock Electric Co. recently secured a contract amounting to $50,000 from the Chicago Elevated Roads for electric equipments. The company's business for July was probably the largest in its history.

The Ford Auger Bit Co., Holyoke, Mass., manufacturer of patent bits and augers, has recently acquired a piece of property formerly owned by the Massachusetts Screw Co., consisting of a main building four stories high, 155 by 40 feet, and of an ell 65 by 34 feet. The company will build an addition which it will use as a forge room containing heavy machinery, and which is to be 65 by 55 feet. The company intends to rent its present quarters, and also some space on the upper floors of the new building. The plant will be run by water-power. The demand for the company's patent auger bit and ship auger has been steadily increasing for many years, and the business for the first six months of 1903 was 50 percent larger than the same period of 1902. While the company has been increasing its capacity steadily each year, it has reached the limit in its present quarters, and has been obliged to purchase new property. It has started moving, and when the building is fully equipped with new machinery the company will have by far the largest bit and auger factory in the world. The company calls special attention to the fact that this large plant will be used in making high grade tools only.

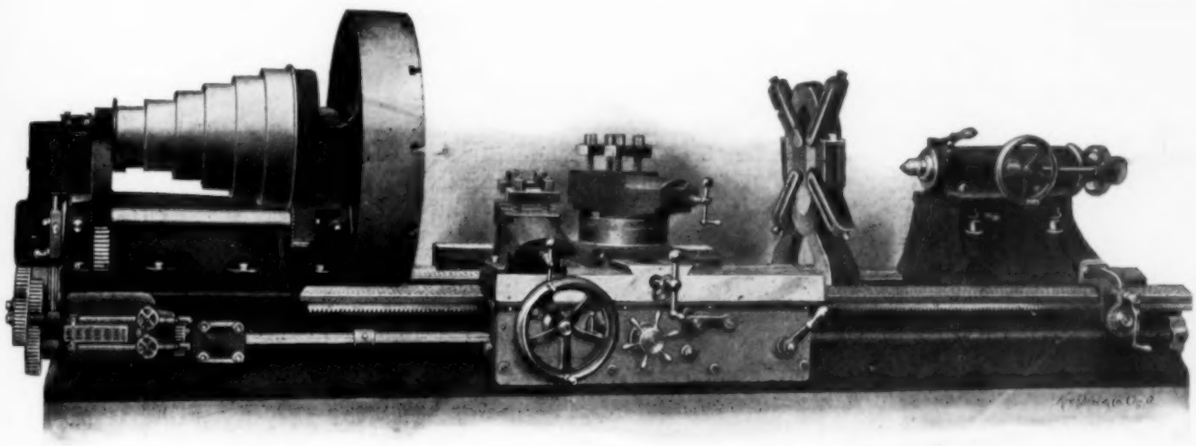
The well known firm of Thos. H. Dallett & Co., of Philadelphia, has lately been reorganized and incorporated as the Thos. H. Dallett Co., with officers as follows: President, Thos. H. Dallett; vice president and general manager, Ernest C. Bliss; secretary and treasurer, E. C. Clay, with W. H. Van Sickel, lately New York representative of the Under-Feed Stoker Co. of America and formerly identified with the pneumatic tool industry, as superintendent. The company will greatly extend and enlarge the capacity of its plant, located at York St. and Sedgley Ave., and while continuing the manufacturing of its well known belt and electrically driven portable drills, deck planers, etc., will devote especial attention to the production of Dallett pneumatic tools. The works are equipped with the latest and most improved machinery, and the extensions projected are necessary to enable them to supply the demand for the Dallett tools, which have by their intrinsic merit gained an enviable reputation.

The plant of the Standard Gauge Steel Co., Beaver Falls, Pa., is now operating double turn in order to supply the heavy demand for its high grade products. The company manufactures machine keys to order and also is enjoying a heavy demand for its elevator guides and gear racks. The keys and racks are made on machines designed and built for this purpose, the company having recently added to its equipment.

A NEW 60-INCH LATHE.

The illustration shows the new "American" lathe brought out by the American Tool Works Co., of Cincinnati. This tool is a 60-inch lathe with improved rapid change gear mechanism which greatly increases the lathe possibilities as a quick handler of heavy work. This mechanism is located on the head end of the bed and consists of a clutch device of an entirely new design through which seven changes for feeding and screw cutting are rapidly available without removal of a single gear. Then, by changing one, and only one, gear on the stud, seven additional changes are provided, the quadrant being so designed as to obviate the readjusting of the entire train of gears to each new change gear. Nine change gears are ordinarily furnished, thus providing a total of 63 changes of threads and feeds with the minimum of effort. Each of these possible changes is indicated on the index plate located on the front of the gear box. By the simple movement of a hand wheel a pointer is brought directly above the desired thread or feed. This indicates the number of the change gear to be placed on the stud, and also automatically arranges the gears in the gear box for cutting any thread or feed desired. Range of threads is from 1 in 8 inches to 16 per inch, and of feeds, from 1.327 to 170. Steel gears are used wherever necessary.

The lathe can be changed for left hand screw cutting by means of a tumbler reverse plate mounted on the end of the headstock. It is not necessary to interpose an idler gear as formerly, and no gears are ever disarranged by this method.



HEAVY ENGINE LATHE OF RECENT DESIGN.

The bed is of patent drop V pattern of such construction as to secure great rigidity. The headstock is massive; driving cone is mounted on its own spindle, entirely independent of the main spindle, and is powerfully geared. Carriage is very heavy, especially in the bridge, due to the drop V bed, and has double apron extending the full length. All gears are coarse pitch and wide face, cut from the solid. Compound rest is fitted with taper gibs and provided with power cross and angular feeds.

The Eleanor Steel Co., of Pittsburg, Pa., has been organized by interests connected with the Eleanor Iron & Steel Co., of Irwin, Pa., for the purpose of erecting a steel plant at Butler, Pa. The plans for two 35-ton open-hearth furnaces are now being prepared and a sheet bar mill will be installed. The entire output of the open-hearth furnaces which will amount to 140 tons daily will be converted into sheet bars and will be sufficiently large to supply a majority of the independent sheet mills with steel. John and George Robinsteen were instrumental in bringing about the formation of the company which will be capitalized at $600,000 and may ultimately erect a large blast furnace.

PERSONAL.

R. F. Diserens, formerly with Hill, Clarke & Co., has accepted the position of sales manager of the Blaisdell Machinery Co., manufacturer of air compressors, Bradford, Pa.

William A. Perrine, one of the best known labor leaders in New York City, has resigned as business agent of the iron molders' conference board to take a position with the Abram Cox Stove Co., Philadelphia. He was appointed civil service commissioner shortly after the election of Mayor Low, and was compelled to resign this position some time ago on account of increasing work for the Iron Molders' Union.

S. T. Wellman, of the Wellman-Seaver-Morgan Co., who has been in Europe for some time, will sail for home on Aug. 7. C. Ernst and F. W. Moller, of the engineering staff of the company, return at the same time.

W. D. Crawford, for four years superintendent and general manager of the Tidewater Steel Co., has resigned to become general manager of the LaBelle Iron Works at Steubenville, O.

David P. Davies, superintendent of the Marinette Iron Works, Marinette, Wis., has tendered his resignation, effective Sept. 1, to accept a position with the Allis-Chalmers Co. Mr. Davies expects to go to Europe in the interest of the latter company this fall.

Charles D. Rhodes, who for several years has been assistant general sales agent for the Illinois Steel Co., Chicago, has resigned to become general sales agent for the Lackawanna Steel Co. He will open an office at 100 Broadway, New York.

Peter F. McCool, general manager of the Standard Steel Car Co., Butler, Pa., has resigned in order to devote his entire attention to the Butler Foundry & Machine Co., which will erect a large steel casting plant at Butler. He will be succeeded by E. G. Caughey, who has been assistant manager since the steel car plant has been in operation.

Garry B. LeVan, who has been superintendent of the Haselton furnace of the Republic Iron & Steel Co., and his assistant, George Brown, have been placed in charge of the Atlantic stack of the company at New Castle, Pa. Bert Deetrick, superintendent of the Hannah furnace, will also have the Haselton furnace in charge. Messrs. LeVan and Brown were the recipients of gold watch, chain and charm apiece from the men in their employ.

Arthur Scranton, superintendent of the Lackawanna Steel Co., Buffalo, has resigned.

Four of the open hearth furnaces of the Dominion Iron & Steel Co., at Sydney, closed down two weeks ago, have been put in operation again. Nearly all the men paid off were ordered to report for work in their old places.

The Ramapo Iron Co., will locate a plant at Niagara Falls, N. Y., in the building now occupied by the MacPherson Switch & Frog Co.

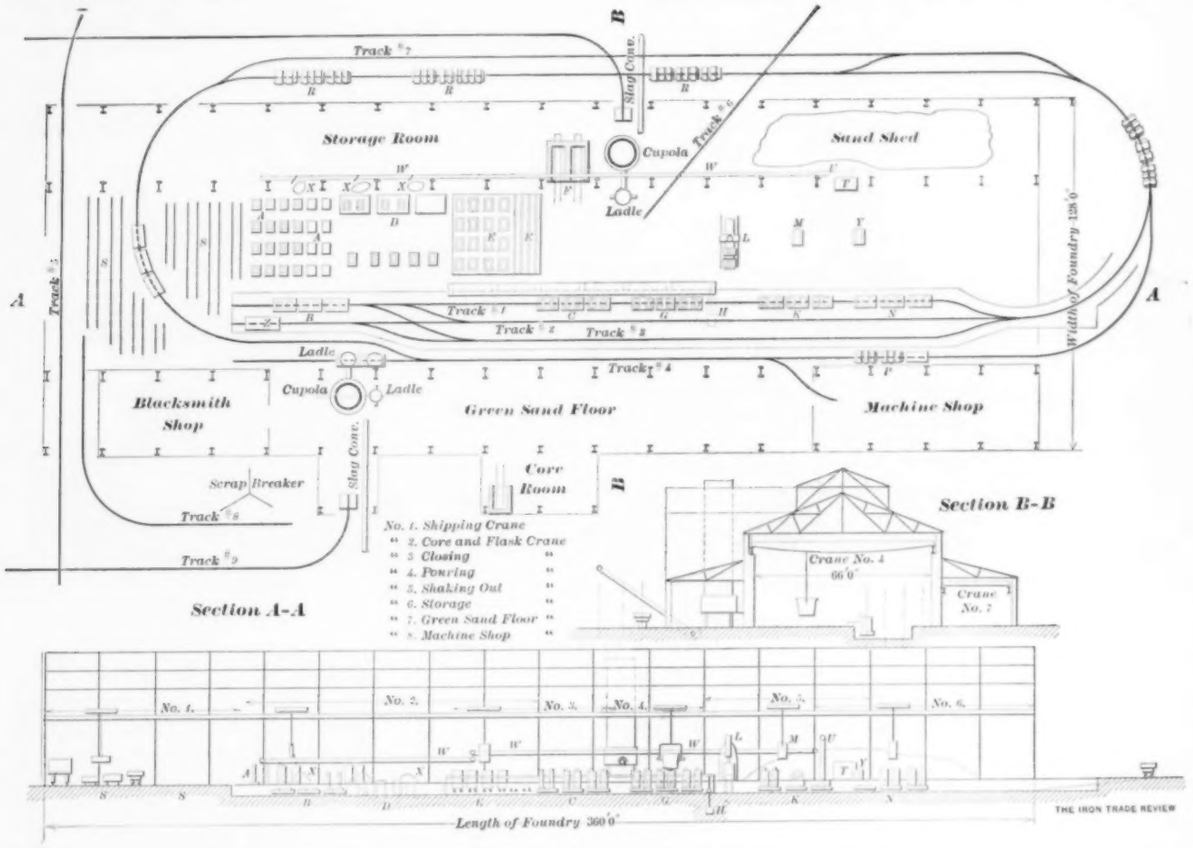
PROCESS FOR MANUFACTURING INGOT MOLDS.

Extensive changes have been under way for some time at the plant of the Thos. D. West Foundry Co., manufacturer of ingot molds, at Sharpsville, Pa., these amounting to a practical rebuilding and re-equipment of the foundry. Radical departures have been made from ordinary practice in such foundries, as will be seen by reference to the accompanying plan view and elevation. The present practice in the manufacture of ingot molds for Bessemer and open-hearth works is as follows:

The molds and cores being first rammed and finished, are placed in a drying oven or covered pits and left over night to dry. The next day they are taken from the drying ovens, assembled on the casting floor and poured, this occupying all the second day. During the night or early in the next morning they are shaken out, and later cleaned, chipped and loaded for shipment, thus occupying 48 hours in the process of making a mold. The flask in which this mold has been made has been employed the same length of time before it can be used again, and to cast any particular mold at the rate of one in 24 hours it is necessary to provide two flasks, since one flask will yield but one mold in 48 hours.

The cores are rammed on plain plates at A and dried in from two to three hours without removal. After this they are set into the prints of the bottoms on the buggies at B. The buggies are now pushed by a locomotive up to C. After the cheek parts of the flask are rammed at D they are removed to racks E where they are finished and dried, the drying requiring from two or three hours' time. The cheek flasks are now hoisted and lowered over the cores at C. A cope and runner box that has been dried in the oven F is placed on top of each flask. After the bottom and copes are clamped to the cheek flasks, the molds are moved up to G and poured.

After the pouring the runner box and cope are removed and the buggies are moved to K where the cheek flask and ingot casting are hoisted together from the buggy to be placed over the pit L. Here by means of a vertical stripper the core bar is pushed out of the ingot casting to drop into the pit. The cheek flask and ingot casting are now hoisted off from the pit and laid flat at M. The uppermost part of the cheek flask is removed with the crane's auxiliary hoist and the ingot mold casting lifted out of the under part of the cheek flask and laid on adjacent ground at Y. The empty cheeks are then assembled and clamped. The bottoms on the buggies hav-



PLAN AND ELEVATION OF THE THOS. D. WEST FOUNDRY CO.'S PLANT AT SHARPSVILLE, PA., SHOWING ARRANGEMENTS FOR CONTINUOUS CASTING OF INGOT MOLDS.

Under the continuous process the Thos. D. West Foundry Co. will employ, a mold will be turned out in less than 8 hours, so that 3 molds can be obtained from one flask in 24 hours. This makes it practicable to use special machined flasks for small as well as large orders (giving a much better casting) in a foundry doing a general mold business, instead of the jobbing or pieced out flasks under the usual methods of making molds.

In introducing continuous operation in a mold foundry the first step is to abolish a permanent casting floor, which is occupied first by the closing of molds, then by the pouring, then by the cooling; later by the shaking out; and finally the floor must be cleaned up before it can be used again. The practice at the Sharpsville plant will be as follows:

The molds are assembled on buggies and kept moving ahead for the successive operations until shaken out, when the empty flask and core bar are returned on a previously used buggy to repeat the operation, thus avoiding the accumulation and delay incidental to successive operations on one place. ing been made up while hot, to be self drying, the cheek parts of the flask are placed back on the buggies in position at N and the core bars lowered inside of them, after which the buggy is transferred to the return track No. 3. When the buggies have been moved down and transfered over to track No. 1 to again be in a position as shown at B, the core bars and cheek flasks are hoisted off the bottoms and placed in position to again make the cores and molds. Dried cores again being set into the bottoms prints, the locomotive Z is brought into action to push the buggies forward as shown.

The sand having been removed from the outside of the hot ingot mold at Y, it becomes necessary, for the comfort of the men, to prevent any accumulation of hot molds at this point. For this reason the mold is hoisted to a buggy made to hold three or more castings placed at P on the surface track No. 4. This track encircles the outside part of the foundry and on it the buggies are left in numbers as at R to cool off the ingot castings. In the wait here the core sand is removed from the interior of the ingot castings, and after they are cooled suffi-

ciently to be chipped they are moved ahead into the left hand end of the foundry, where they are placed on tracks at S ready for clipping or chipped as they lie on the buggies. They are then hoisted, weighed and placed in cars on track No. 5 for shipment to consignee.

The sand is mixed in the locality where the ingot castings are taken out of their flasks at M and Y, and adjacent to new sand, by shoveling into a Standard Sand & Foundry Supply Co.'s disintegrating, riddling and mixing machine T. The sand is mixed to the right dampness and strength by the addition of new sand obtained from the sand sheds close by, and is conveyed from the mixer T by buckets U and belts W and delivered ready for use on the mold and core rammer's floor at X.

The plan of tracks shown allows for great flexibility in the movement and storage of buggies that may be called for by reason of breakdowns in cranes or machinery, or the interruptions of systematic pouring periods. Locomotive power is best adapted for this work, as independent movement of the buggies is essential. The locomotive and buggies are arranged so that the latter can be moved by a push or pull of the former while on a side track, as well as on the same track. The combination of the three tracks with their switches placed below the general floor level affords convenience and economy in closing and casting the molds. Arranging tracks and power to move loads longitudinally of the foundry allows the traveling cranes to localize their work so that none of them will interfere with the others. This avoids the wide range of longitudinal crane travel and the loss of time in one crane getting out of the way of another, as generally experienced in all foundries having two or more traveling cranes.

This plant is designed for 10 molds per hour, each weighing from 3,500 pounds up, and operating on the continuous plan would produce 240 molds a day. The plant is located within a half mile of seven merchant blast furnaces, running on Bessemer iron, and the facilities for making molds either from direct or pig metal are exceptional. Gas engines operated by natural gas and direct connected to generators furnish current for the motors. The main building is located in about the center of the company's land, leaving ample room for storage of stock and for such out buildings and driveways as is necessary for a large foundry. The location is central for obtaining raw material and for the distribution of output. It has the advantage of four roads, Pennsylvania, Lake Shore, Erie and B. & O., for shipping castings.

Patents are being applied for, covering a number of the novel features of the appliances and plant.

An "Arbitration" Test Bar.

At a meeting of the Cast Iron Committee of the American Society for Testing Materials, held at Philadelphia, July 31, there were present in addition to Chairman Walter Wood of Philadelphia, Thos. D. West, of Sharpsville, Pa.; Dr. Richard Moldenke, of New York; A. E. Outerbridge, Jr., of Philadelphia; and Henry Souther, of Hartford, Conn. The meeting discussed the size, method of casting, etc., to be recommended for the "arbitration bar" favored at the recent meeting of the cast iron section of the American Society for Testing Materials at Delaware Water Gap, Pa. It was decided to recommend a 1½-inch round bar, 15 inches long, cast on end, the bar in testing to rest on supports 12 inches apart.

One of the most important new industries of Los Angeles, Cal., is the Stetson-Spencer Can Co., which is manufacturing fruit cans. It is turning out about 5,000 cans daily, employing about 50 men. The company expects to enlarge its plant next year, so that it will give employment to about 200 men and boys.

W. J. Dodge and associates, Gadsden, Ala., have leased the old Caldwell Foundry at Fort Payne, Ala., and will shortly form a $25,000 stock company to operate the plant. From 50 to 60 men will be employed

The wire nail mills of the Colorado Fuel & Iron Co., Pueblo, Col., employing over 200 men, were started a few days ago. Everything ran smoothly. The first nails were taken by employes as souvenirs.

SOME GERMAN BUSINESS FORMS.

BY ROBERT GRIMSHAW.

Continuing the series of forms of the "Duca" system (see *The Iron Trade Review* for Jan. 1 and May 7, 1903), I show the arrangements of a card, both sides alike, used by a south German concern in the stock department. This card refers to one special article and enables the stock-keeper to know at once how many thereof are on hand and, if the piece is one which is constantly demanded, whether more should be ordered at once or not. The card, Form No. 1, is arranged as follows:

Description .....

Out .....

Date. From. Quantity. @. $. Cts.

Form No. 1.

The card being wide enough to allow the last line to be repeated three times across the card.

The following forms are from the two sides of a card used in the same locality and constituting a record of a single job with the one workman. This form has some points of resemblance to some American cards. The face of the card, Form No. 2, is arranged in this manner:

Name ..... No. ..... Piece work No.....

Order No..... Drawing No..... Piece No.....

....

Article .....

Operation .....

....

No. Pieces..... Price per Piece..... Amount.....

Begun ..... Date .....190..

Finished .....

Form No. 2.

The back of this card is headed as in Form No. 3, for the six columns.

Paid.

Date. Hrs. Amount. Date. Hrs. Amount.

Form No. 3.

The same shop has a form for piecework referring to a single operation on the one piece or set of pieces by the one workman only. This card is shown in Form No. 4.

Date .....190..

Workman's Name..... No. .....

Job No..... Hours .....

Drawing No.....Price No..... Piecework No.....

Article ....

Operation ..... Deduct.....per hour.

..... Amount .....

....

A special card is to be filled out for each job. Foreman.....

Approved.....

Form No. 4.

Form No. 5 is a "Customer Card," keeping the record of all information wanted instantly about a firm and also serving as a "tickler."

Name ..... Business .....

Town .....

Address .....

Price Lists .....

.....

Orders .....

.....

.....

Remarks .....

.....

.....

Form No. 5.

In Forms 6, 7 and 8 we have the front and back respectively of the one card and the face of another one used for communication between the general office and the shop. The first is in triplicate in red, white and blue, the white remaining in the office, the blue going to the assembling department and the red to the smith shop, foundry, etc., as the case may be. Each department which has done work sends its card back to the general office, thus posting the latter as to prompt or delayed delivery of the finished pieces.

Order No. Dept. Signature Foreman. Date given out.

.....

Date Finished.

Piece..... Drawing No.....

Description .....

.....

.....

.....

.....

..... % ....

Must be ready by .....

Signature Supt.....

Form No. 6.

The above card has in a conspicuous position the following instruction: "All wages and material for this order are to be charged to it under the number above given. On completion of the job the foreman is to supply any missing data and deliver this card to the superintendent."

The back of Form No. 6 is headed as follows:

Following Sub-orders given out. Signature Foreman.

.....

Date. Dept. Article. Date Delivery. Prices Rec'd.

Form No. 7.

According to Order No. For. Dept. Sig. Foreman. Date given out.

.....

Date finished.

(A) .....

Piece. Article. Drawing No.

.....

.....

.....

.....

Must be delivered by.

Signature.

.....

Form No. 8.

The original card has the following printed at (A), Form No. 8: "When the piece is finished the foreman must fill out the blanks in this card and deliver it with the pieces to the undersigned who will deliver the card at once to the superintendent."

Form No. 9 is another stock department form which requires no explanation beyond the statement that the last three heading are repeated to form nine columns on the card.

Date. Quantity. Price. Date. Use. Quantity.

....

Form No. 9.

The Evolution of the Determination of Iron in Ores.*

HARRISON W. CRAVER.

The first methods of testing ores were dry or fire assays. These were early developed; in fact, must have originated soon after the smelting of ores was begun, for it was a simple step to introduce the system of carrying out smelting operations in miniature before undertaking workings on any considerable scale. Not until the sixteenth century, however, do we find many references to such assays; and at that time the methods were quite fully developed, so much so, indeed, that no great changes have since been made.

The art of assaying then formed a special branch of knowledge. It was the sole branch of chemical analysis practiced, the balance being already the chief instrument, and the simplicity and clearness of the methods showed a wide divergence from the strange operations of the alchemists and adepts. Thus, although used only by miners and smelters, assaying was in a way the starting point of modern chemistry, for exact chemical knowledge first began with the use of the balance for proving all chemical operations.

In general, the early assay methods were small scale reproductions in the laboratory of the smelting process to be employed. As the smelting of iron was a comparatively simple process the assay was also easily made. The first method of which we know was a simple crucible assay. The powdered ore mixed with charcoal powder was placed in a crucible and heated. A smith's forge or an assay oven in which the hearth was replaced by an iron ring was used. The crucible was placed in the ring, charcoal piled around and the fire blown by an ordinary leather bellows.

The chief object of the assay was the determination of the percentage of iron, but the same process could be used to determine the correct proportions of ore and fluxes in the smelters. This "burdening test," however, was little used in the sixteenth century. The importance of a correct sample was well understood, and sampling done much as today. With a shovel, portions were taken from various points of the ore pile. These were re-piled and the process repeated; this sample was then powdered and mixed and from this the charge taken. This was mixed with the needed flux and charged in a crucible.

The chief sources of our knowledge of assaying in the sixteenth century are the writings of Georg Agricola and Lazarus Erker. In the seventh book of Agricola's great work on metallurgy, "De Re Metallica," he gives directions for testing iron ores. The sample is to be roasted, powdered, washed and dried. A magnet is then brought in contact with the ore and the adherent particles of iron brushed off in a crucible. This operation is repeated until no more particles are attracted by the magnet, when saltpeter is added as a flux and the crucible ignited until a button of iron is obtained. The readiness of the ore to cling to the magnet affords some idea of its richness or leanness.

In 1574 Erker published at Prague the first book dealing with assaying alone. His directions are practically a repetition of those of Agricola, although given in greater detail. In his chapter on testing iron ores he says: "Iron stones can in no way be more easily and better tested than by the magnet. If you will thus test it, roast it (though some take it unroasted), rub it fine and take a good magnet and wave or draw it through the ore. All the good iron hangs to the magnet; brush it off with a hare's foot and stir the iron stone again with the magnet as long as you can lift any with the magnet, until at last what remains will not hang; that is barren and not good stone. Thus you con see if a mine contains iron or if an iron stone is rich in iron, for, as stated, the magnet raises no other metal, but iron and steel alone.

*Read at April meeting of Chemical Section of Engineers' Society of Western Pennsylvania.

"Steel stone, however, which is quite unlike iron stone in color and some of which looks like a yellow spar, is, as is also some iron stone, not lifted by the magnet when raw; one therefore roasts the steel stone, when it colors to a shade like rich iron stone, the magnet then attracts it gladly, and more strongly and quickly than iron stone."

The chief characteristic of these old iron tests is the preparation of the ores, particularly the roasting and the separation of the magnetic portion. In many respects, the melting differed from that used today. The crucible used, as shown in Agricola's drawings, was the so-called Hessian crucible, circular at the base and triangular at the mouth. This was lined with a mixture of clay and charcoal 3 mm. thick, the usual proportion of the mixture being 33 percent clay and 67 percent charcoal. The mixture which effected the reduction, consisting of 25 percent clay and 75 percent charcoal, was then tightly packed in, leaving only a small central aperture for the sample and the flux, which had been previously ground together in a mortar. The fluxes used were such as would easily reduce the silicates present to a fluid glass; Agricola mentions saltpeter only. Later additions were made of such substances as lime, clay and sand, suggested by their use in blast furnace burdens.

The smelting was usually carried out in a smith's forge before the blast. The crucible was luted with clay and covered with a charcoal cover, on which charcoal dust was heaped for further protection from the blast. The heat was gentle at first and increased gradually, about one hour being required for an assay. The weight of the button gave the yield of pig iron, while from its appearance and that of the slag some indications of the worth and properties of the ore could be drawn.

The knowledge of wet methods of iron analysis was entirely confined to a few qualitative tests such as that mentioned by Pliny, who speaks of tincture of galls as a reagent for iron. This was used by Paracelsus to detect iron in mineral waters. An interesting test for impurities is given by Vanuccio Biringuccio, who was the first important writer on metallurgy among the Latin races. This test consisted in placing the ore in a "strong pickle" (nitric acid), and after removal drying it over a fire and observing the color of the fumes. Or the ore was allowed to remain in the acid for a longer time and then a stream of air was blown through the liquid, the bubbles showing the presence of copper.

An official assay office was opened in Nuremberg in the first half of the sixteenth century, in which special attention was given to ores. During the 17th century no advances of any moment seem to have been made in assaying. The fire assay remained the only available test.

In 1697 a work on testing was published in Dresden by Christian Carl Schindler. He gave directions for iron assays as follows: "Take iron or steel stone, rub it fine, weigh out two centners (assay centners or hundredweights) and roast thoroughly. When cold, divide it. To one part add 2 centners of black flux, 1 centner of sal ammoniac, ½ centner of glass-gall and ½ centner of finely powdered charcoal, mix well together, cover well with salt and heat in the blast for a full quarter of an hour." Or: "1 centner roasted iron stone, 1 centner lead-glass, 2 centners black flux of 2 parts saltpeter and one part argols, and ½ centner finely powdered charcoal." Or: "Take two quarts of old stinking urine, and add a handful of pulverized argols and the same quantity of glass-galls or potash, and boil down until solid; then powder and use 6 centners of this flux to 1 centner of iron stone. Cover with salt, and ignite for a full quarter of an hour."

In the 18th century the fire assay was the only analytical method until the latter quarter of the century; and even then the little knowledge of wet methods extant was confined to a few chemists.

One of the important works of the century on assaying was Johann Andreas Cramer's "Docimasia," published at Leyden in 1739. A revised edition appeared in 1743 under the title "Elementis Artis Docimasticæ," and was translated into English and French.

Cramer rejected the test with the magnet and remarked the unreliability of the crucible assay for iron in comparison with that for other metals. He says: "A very strong and long continued heat is necessary to form the reduced iron into a dense regulus. As there is no certain indication when this is accomplished, and as longer heating than necessary causes a notable amount of iron to go back in the slag, the test is always uncertain." Cramer also hammered the button to obtain some idea of its quality.

The next considerable advance in our knowledge of the analytical chemistry of iron was due to Bergman's investigations. Torbern Bergman (1735-1784) was professor of chemistry in the University of Upsala from 1767 until his death. He contributed much to our knowledge of analytical chemistry, his books and papers containing the results of much original investigation and giving clear, practical directions for the analysis of many inorganic bodies.

Up to this time the use of wet methods of analysis had scarcely been attempted. Their introduction by Robert Boyle at the end of the seventeenth century had not led to further development, and apparently their only application was to the analysis of mineral waters. In this case, however, they were only used qualitatively. Bergman first gave an extensive survey of the value of reagents and their effect. He gave directions for the course to be followed in a chemical analysis, and introduced the method of converting constituents into compounds of known composition and easy isolation rather than attempting to isolate those present. He made the first complete analysis of a mineral water, using practically the method in use today. He also studied the use of the blowpipe in determining minerals, and the art of blowpipe analysis of today rests on Bergman's directions.

The chief value of Bergman's labors lies in the methods he invented and by means of which he greatly increased the extent of the field of chemical research. The results of his quantitative analyses have proved rather inexact, although during his lifetime his fame as an analyst was such that his results were never disputed.

Bergman's method for iron was as follows: The iron ore was powdered as fine as possible, weighed out in a glass flask and digested with a mixture of one part nitric acid and two parts hydrochloric acid for some days; at boiling if the ore was difficultly soluble. The insoluble residue was filtered off on a blotting paper filter, washed with hot water and ignited. The filtrate and washings were combined and the iron precipitated with "blood-lye." This was prepared according to a method discovered by Macquer from white flux (argols and saltpeter ignited together) and Berlin blue. This "blood-lye" was added to the iron solution drop by drop until no more blue precipitate formed. A slight excess of the reagent was then added and the precipitate allowed to settle. It was then filtered, washed with hot water, dried, weighed, the weight of the filter subtracted and the amount of iron calculated from the weight of the Berlin blue. From numerous experiments Bergman found that one part of iron in the solution corresponded to six parts of Berlin blue and used this as a foundation for his calculations. The results by this method were much closer to the true values than by the crucible assay.

For common analyses Bergman considered it sufficient to dissolve the ore in acid, neutralize, and then find the amount of lime necessary to precipitate the iron. From this the iron was calculated.

The end of the eighteenth century found the analysis of ores and the determination of iron still in a poor condition. Lack of knowledge of the processes of oxidation and the oxids and hydroxids of iron prevented the correct calculation of analyses; and the faulty methods of analysis contributed in still greater degree to poor results. As the fire assay was still the common process, and as this gave a cast iron button, the results were ever high. The remaining constituents were determined and the resulting difference called oxygen. Bergman's method of

precipitation as Prussian blue (ferric ferrocyanid) also gave high results, and as incomplete washing, etc., usually caused high values for other constituents the sum of an analysis usually exceeded 100 percent. This value the chemist usually reduced to 100 percent according to his preconceived ideas, thus still further reducing the worth of the work. The first chemist who had sufficient courage to publish the actual results of his iron analyses was Klaproth (1743-1817).

The only change in the fire assay, which still retained its popularity and was considered superior in exactness to the wet assay, was in the use of more difficultly soluble fluxes. Guyton de Morveau, Kirwan and Chaptal give the same flux, glass and borax being the chief ingredients. Mushet gives the following recipe as being furnished him about 1794 as the most perfect then known in England:

"Two ounces of iron-stone calcined.

"One ounce of pouynded bottle glass.

"One-half ounce of limestone pouynded smale.

"Mix up and melted, and then stir up with an iron rod for two or three times, and if the regulus appears thin and hot the separation is made, if not put in ¼ ounce of Pott Ashe and stir up again, and then draw the pott and let cule, and the metal button will be found at the bottom."

This was given as applicable to every iron ore.

We have some data which give an idea of the results obtained by these assays. Kirwan gave as the results of the analyses of magnetite the iron as equal to 80 percent (pure magnetite=73.4 percent). Lampadius, in his Hüttenkunde (1801-1810) questioned this result and considered it low, as his own assays gave 80 percent iron. He also questioned Kirwan's results of 70 percent to 76 percent iron in red hematite (pure hematite=70 percent iron), as he had obtained a value of 80 percent iron by fire assay.

In 1839 a method was published by Fuchs which was short enough to replace the fire assay in practical work. This method was based on the observation that hydrochloric acid did not attack copper when excluded from the air, but that solution occurred if ferric chlorid was present, ferrous and cuprous chlorids resulting and the amount of copper dissolved being proportional to the ferric chlorid present. The iron could therefore be calculated from the loss of weight of the copper.

This method was the leading one until about 1846, when it was replaced by the permanganate method, which was invented by Marguerite. His directions called for solution in hydrochloric acid and reduction with sodium sulfite. In 1862 J. Loewenthal and F. Lenssen announced that this method was inexact when carried out on a solution containing hydrochloric acid, and that it gave correct results only when the iron was present as sulfate, and sulphuric acid the only free acid. About the same time Fresenius gave directions for use in cases where the use of hydrochloric acid could not be avoided.

The reduction of ferric solutions by zinc was discovered previous to this time, but in 1862 Mitscherlich first gave exact directions for its use. The bichromate method made its appearance in 1850, the discoverer being Dr. Penny, of Glasgow. He used sodium sulfite as a reducing agent. The other methods used for iron determination are the stannous chlorid method and the Zimmerman-Reinhardt method. The introduction of the first seems to have been due to Fresenius, and was published about 1865. The latter was published in 1884. To Zimmerman was due the introduction of manganous sulfate as an aid in titrating hydrochloric acid solutions with potassium permanganate, while Reinhardt suggested the method of reducing with stannous chlorid and taking up the excess with mercuric chlorid. In 1888 he also introduced the addition of sulfuric and phosphoric acids to the manganous sulfate.

These methods are in all essentials the ones in common use today. The only changes have been minor variations and the formulation of rules to insure uniformity of manipulation and results. As now used they leave little to be desired in the way of speed, ease of manipulation and accuracy.

Cleveland Machinery Market.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Aug. 5.

Midsummer business among Cleveland manufacturers and dealers reflects little, if any, of the prevailing dullness in some lines of material. While there is not the rush of orders of a year ago, nearly all of the plants have about all they can do.

The Chase Machine Co. shipped last week to the Western Electric Co., Chicago, a four head tandem cabling machine, weighing about 30 tons. Its books are full of orders in this department of the business.

The Parish & Bingham Co., manufacturer of cold pressed metal work, is exceedingly busy in all departments and finds the outlook for business very encouraging.

The Atlas Car & Mfg. Co. advises that business during the past season has been extremely heavy, and present indications point to no immediate abatement. This company is at present completing a number of large contracts for complete industrial railway equipment, furnishing all of the track, switches and rolling stock, etc. It expects to make complete shipment within a short time for an order for 40 20-ton bottom dump cars supplied with air brakes. These cars are similar in general design to the pressed steel hopper cars used by the steam roads. The company is also executing an order for 200 cars to be shipped to the Philippines. The company has recently increased its capacity by a new structural shop. This in a great measure has relieved the crowded condition of the shop and placed the company in position to handle a larger bulk of business than ever.

The G. C. Kuhlman Car Co., Collinwood, has recently booked several large orders for closed city car bodies for eastern cities. Among these orders might be mentioned the following: 25 car bodies for Boston Elevated Ry. Co., Boston, Mass.; 50 car bodies for International Ry. Co., Buffalo, N. Y.; 50 car bodies for Brooklyn Heights Ry. Co., Brooklyn, N. Y.

The Reliance Gauge Column Co. has not yet experienced any relaxation of the very satisfactory business it has done for the past year. One of the largest and most prominent boiler manufacturers in the country who has used Reliance safety water columns freely for several years past has recently decided to use them on his boilers as a part of his standard equipment and has just placed his order for 500 Reliance columns. Foreign inquiries and orders are increasing. Among others an order for 20 Reliance columns was received last week from Cia Industrial Jabonera, South America.

The Elwell-Parker Electric Co. reports conditions and prospects are excellent. The company recently received good orders for its motors and generators, in motors from 800 to 1,000 h. p. In addition to this new business it has large and important business in sight which it fully expects to put on its books, including large orders for automobile motors and equipments.

The Cleveland Gear Works removed Aug. 1 to No. 35 Michigan St. for the advantage of more room and a more central location. It has found business very good in the past few months since its change of management. It expects to make some additions to its machinery and tools.

The Electric Controller-Supply Co. reports that its business is on a steady increase and it will soon have ready for the market a number of new pieces of apparatus. It has succeeded in landing lately large contracts for its standard apparatus.

The Standard Welding Co. reports that orders, considering the summer months, are good, and from contracts it has closed, and is closing, and from inquiries that are in, and by this method feeling the pulse of the general trade, the company says the coming year looks bright, in machinery building, general iron and steel product manufacture. Buyers are conservative, indicating a general healthy aspect.

The Cleveland Elevator Bucket Co. is very busy, July having been the best month for orders that the company has ever had.

The C. O. Bartlett & Snow Co., of Cleveland, has erected at its works a Triumph steam dryer and a direct heat rotary dryer, both typical products of this company. They will be used in making test runs in the drying of any material sent to the company, the intention being to demonstrate by such experiments how much moisture can be removed in each case, and arrive at a basis of estimating cost where these machines are used.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

There are certain novelties which receive scant attention from the technical papers. I suppose that it may be explained on the one side by the assertion that the thing proposed is no improvement and to this opinion the other fellows can aver that the skepticism is based either on conceit or jealousy or a sad compound of the two. Nevertheless many of these suggestions add to the fund of knowledge in matters mechanical and often develop to patentable and promotable stages and that certainly cannot be said of all the ideas of admitted merit. For instance, here is a timely invention. Right in the season of the year when my neighbors at home and office hie to the hills and dales or whatever may be the best way of spending a vacation from their point of view, along comes something to fill the long felt want in fans. Fans are all right with a power plant attachment. With hand operation they are to be classed with filing and chipping processes, something that can be done and is often done—but not sought if the end can be had another way. Who has not sweltered even in an easy chair in these torrid days? But help is at hand and perhaps with later improvements the man in the shop will carry around his motor and fan equipment to his various jobs.

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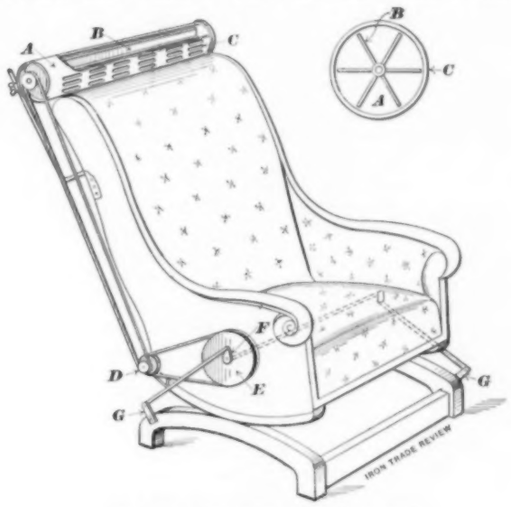
Here is the scheme in the illustration. The engraving follows the lines of the invention described in patent No. 730271. It proposes to corral the waste energy which may otherwise go to the task of thinking and saying fitting things about the sultry weather. There is a fan within a cylinder



A MACHINE FOR THE HOT WEATHER.

and when the chair rocks the fellow in the seat turns the idle air of the room into a useful breeze around his collar. Fig. 1 is the invention applied to a rocking chair and Fig. 2 is a sectional view of the perforated cylinder containing the fan. The cylinder A is attached to the chair brackets by wing nuts so that it can be turned out of the way when cool days have arrived. The fan is seen at B, and C stands for the opening through which the air is delivered to the occupant of the chair. The fan pulley is connected to a double pulley at D and a couple of half-round belts run around the scored pulleys seen near A and at D and E. There is a crank at F and a connecting rod joins F and G and this crank arrangement is duplicated at both sides of the chair.

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The mere rocking of the chair turns the crank at F and thus raises the wind. How far there is a fair equivalent for the energy put into the rock is for the scientists to experiment, calculate and guess. But this is not the only hot weather suggestion. There are many arising during the summer months and they should be kept in mind. Too many of them are so soon forgotten. Here is one that is going the rounds of the press: "The discovery of heavy crude oil in Texas and the necessity for its utilization has stimulated the search for a means whereby oil may be economically substituted for coal as a power producer, and such means is believed to have been found in the invention of the Ostergren fuel oil engine, for the manufacture of which a corporation known as the Fuel Oil Power Company, capitalized at $5,000,000, has been incorporated by act of Congress. It is claimed for this engine that it will produce power in any desired capacity at one-tenth the cost of power produced by any other engine previously known. It is particularly adapted for transportation work. An 800-horsepower locomotive of this type would run from New York to Chicago in 20 hours and consume only 25 barrels of oil, at a fuel cost of not more than $27."

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And here is another which goes more fully into details: "The new Hydroilogen Engine, which has been patented by C. D. Knapp, Jr., & Co., New York, was on view last Tuesday at Broadway and 31st street, New York. The company are incorporated in New Jersey with a capital of $25,000,000. A large factory is to be built at Bayonne, with a capacity of at least 3,600 engines per annum. The syndicate claims that its engine saves about 80 percent in the cost of production of power and that it will produce horsepower for ⅛ of a cent per hour. The basic idea of the hydroilogen engine is to provide a fuel occupying the least space and having the least weight, from the very cheapest elements that will operate an engine of the most simple and smallest design and weight possible, with the least possible expense in labor and the greatest possible economy in use of fuel. This has been accomplished by the use of low-grade fuel or coal oil, preferably Texas oil, water and air, gasifying the oil and decomposing the water into hydrogen by mechanically combining and mixing them with air, heated to an intense degree by heat." Do not overlook the superlative nature of the outfit. The mechanic who could have the nerve to even dream of improving such a combination of excellencies would paint the lily with any old pigment. If it were not that the injudicious might class me too hastily with these I might venture a hint that the injection of water into a gas engine cylinder is not so broadly novel after all but this is probably a totally different scheme.

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The New York Herald tells at length of an inventor who proposes to make the heaviest train as light as air. It is very simple. What indeed could be more elementary than the following: "A series of magnets under a miniature car running on a steel railway track. The magnets were insulated and attached to the bottom of the car so that they came under the rail and about an inch below it. Then he turned on enough electricity to make the magnets active. They rose upward toward the rail, lifting the car bodily in the air. The weight of the train was thus simply overcome. The inventor next loaded heavy metal into his miniature car until it weighed several tons. The magnets clamped tightly against the rail and refused to slide easily. But as he loaded on the weights he found that the car moved easier the more weight he applied up to the point where a balance was determined between the weight above and the attractive force of the magnets below. The entire weight of the car and its load was held up by magnetic force. Practically the attraction of gravitation was abolished. The car no longer weighed anything. Instead of bearing heavily down upon the track it pulled upward; and to make it run easily all one had to do was to add more weight—more load—in the car, completely reversing the existing order of things where it is a case of the greater the load the heavier the train and the slower. The invention is simple. The train readily slides upon its magnets, the under side of the track being kept well oiled. The wheels are left above the magnets, running on the top of the rail, without carrying any weight, but simply left there to act as a guide for the train and to prevent it from leaving the track. High speed is therefore perfectly safe."

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Nothing in this publication I hope will be understood in a wrong light. I have all the regard in the world for the ideas that are the result of enterprise tempered by logical experience. Sometimes enterprise will go a long way toward success with a very little ballast in the way of logic or experience and I know of many things which will persist in the most aggravating way of turning out bigger successes

than were contemplated by the expert. Is it not a fact that the tardiness with which the expert launches an opinion has its birth in his previous mistakes or misunderstandings? Everyone strains at a chance to gain time for the sober second thought and not be caught at it. Lighting a cigar or a pipe permits a halt while the smoker gives the matter deliberate reflection and saves his credit many and many a time. But there are people who believe that the mechanic rushes in only too ready to give an authoritative opinion. One of the magazines has something to say about this point of view and in order that it may set the man straight who is inclined to be bumptious I send it on as a worthy companion to the clippings I contribute to this issue.

* * * * *

I may say by way of introduction, however that it refers to mechanical engineering of the oil fields, and we are told that: "You will find the same methods of power transmission that were in vogue at the very outset, consisting merely of a pumping shanty, located somewhere near the center of a group of a dozen or more wells, and supplying power to all of them. This power is transmitted by means of a primitive shafting of light strips of wood fastened end to end, and extending in a straight line to each well. The shafting is connected with the engine in such way as to cause it to move back and forth like a piston with each revolution of the power machinery, and in this way the pump at each well is kept in motion. Of course the line of shafting must be kept off the ground, as a total loss of power would result from the friction if it were stretched along the surface of the earth, and to this end the shafting is supported at intervals of a few feet by stakes resembling big pairs of scissors set up on end with their points resting on the ground; and these supports rock back and forth with the motion of the piston-like shafting, so that the whole outfit has the appearance of nothing else so much as a stake and rider fence in a wobbly state of intoxication. The impression given the stranger is positively uncanny, when he sees for the first time a series of these oscillating fences radiating in various directions."

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"The man who is in any way familiar with this method of power transmission is also aware that the system is invariably condemned by mechanical experts as being too crude and cumbersome to be worthy of serious consideration. Let an expert be sent to the oil fields to examine into and report on any of the properties thus operated and he will tell you positively that the thing is impossible. 'The loss of power in such transmission will be so heavy that by the time it reaches the wells there will be none left for running the pumps,' this expert will declare. 'What you need is a power system that won't waste itself in reaching the point at which it is to be utilized, and this system will never do in the world.' And yet at the very time your expert is doing all this figuring and is telling you all about it, the little ten or twelve horsepower engine is wheezing away in its shanty and is earning dividends by producing the oil that the expert says couldn't be budged; all of which shows that your mechanical expert may have his theories and technicalities down to the finest point imaginable, and yet be completely stumped by the old-fashioned country blacksmith, who devises the pumping machinery thus utilized."

* * * * *

"I was very strongly impressed with that point a few years ago," said a member of the party, after these points had been emphasized, "by the success of a Cleveland man who was selling electrical machinery in this territory. This chap was no mechanic at all, but he was so good a salesman that his company kept two mechanical experts in the employ of the Cleveland office figuring out the mechanical problems that were constantly arising. One day the salesman wanted to install a power apparatus for working the organ in one of the down town churches, and the problem was one that called for automatic working of the switching machinery. The experts said it couldn't be done, but the salesman knew better and he guaranteed to accomplish it. Thereupon the expert was extremely critical and declared that the only result would be to entail a serious loss to the company without achieving anything. The salesman went ahead, however, hired a carpenter, had the carpenter purchase about fifty cents' worth of ordinary lumber, and before night they had the thing working to suit the taste of the most exacting and all at an outlay of less than $2.00 for material and labor. It was simply a case of the expert knowing too much about technicalities to let common sense get into action, and the common sense of the salesman won the day and made the profit." 'Twas ever thus. But why say that the salesman was no mechanic? Or how much of a mechanic was the carpenter who got $1.50 for his share? However, these questions are of little consequence now. They got the idea out of their heads somehow and probably had lumber to spare.

A SYSTEM OF SHOP ORDER NUMBERS.

The paper on "Shop Management" read at the Saratoga convention of the American Society of Mechanical Engineers contained a reference to the mnemonic system of order numbers invented by Mr. Oberlin Smith and amplified by Mr. Henry R. Towne, of the Yale & Towne Manufacturing Co., of Stamford, Conn. Mr. Towne in response to an inquiry from this paper kindly dictated the following comment:

"I am not sure what Mr. F. W. Taylor had in mind when referring to a system of order numbers invented by Mr. Smith and amplified by me. Probably, however, he refers to the system of symbols for shop accounts which I devised many years ago and which we still use. The essence of this consists in using letters in the same manner as figures are used in the decimal system, i. e., by making the value of the symbol depend on the "column" or position it occupies relatively to a base. For example, we use letters to designate our departments, A, B, C, etc., and a second letter to indicate a division of any department, thus—AA, BA, CB, etc., and in a few cases we also use a third letter to indicate a sub-division, i. e., AAA or AAB.

"Our department A is a large one with many divisions. The symbol AD designates division D of department A. The symbol ABA would designate sub-division A of division B of department A, and so on. Everyone using the system quickly learns that the significance of a letter depends on its place or position, that a single letter implies a primary account or division and that if the symbol contains two letters the first indicates the primary account and the second a division of it. There being twenty-four available letters (omitting I and O because liable to be confused with figures) the system has great flexibility and almost indefinite scope. For certain purposes we also combine figures with the letter, the symbol of a certain account for example being ML43, the number 43 indicating a certain class of expense incurred for division L of department M.

"I have also utilized a modification of this plan to provide symbols for catalogue numbers of goods, by using a letter arbitrarily to indicate a certain group or class of goods, a number to indicate the mechanical variations of the article and one or more additional letters to indicate the variables which are constant to the whole group such as metal and finish. For example, the symbol TS726A is composed as follows:

"'T' indicates a group of Trunk Locks.

"'S' indicates that the material of construction is steel.

"'726' is an aribitrary number indicating a certain mechanical construction.

"'A' indicates that the surface finish is brass plate.

"While a symbol of this kind is somewhat complex it has the great advantage of assisting the memory of anyone familiar with the system. In the above illustration, for example, everyone familiar with the system knows at once by the letters that the article is a trunk lock, made of steel, and brass plated. The only uncertainty is as to the mechanical construction of the particular lock designated by the number 726.

"Both of these applications of the system were devised by me without any knowledge of what my friend Mr. Oberlin Smith may have done in a similar way and have been in use for many years. I know that he has some system of symbols for his presses, which involves the use of letters and numerals but I have never been familiar with the principle on which it is arranged. You will note that the two plans above described are quite distinct. The one first referred to in which the value of a letter depends on what may be called its 'decimal place' I regard as the more useful of the two and as being available for many purposes."

MOTOR-DRIVEN SPEED BOX FOR RADIAL DRILLS.

A speed box driven by a constant speed motor has been brought out by the Mueller Machine Tool Co., of Cincinnati, and applied to the standard line of radial drills which has already had detailed description in *The Iron Trade Review*. A half tone prepared from a photograph of the device is shown in Fig 1, and sectional views and an end elevation are illustrated in Fig. 2. An end view is shown on the left of Fig. 2 and the lower of the two sectional views is a vertical section

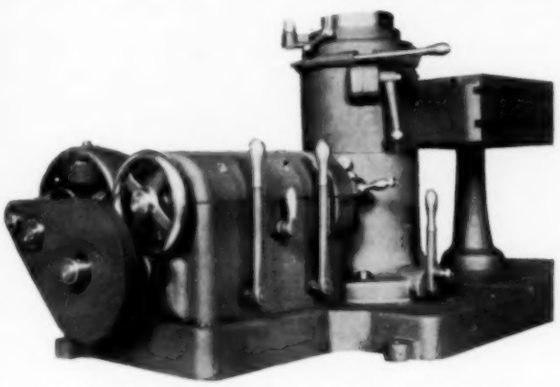

FIG. 1.—NEW SPEED BOX FOR MUELLER RADIAL DRILL.

through shafts B and C, while the upper shows a horizontal section through shafts A and B.

The two long levers seen in front of the box operate four friction clutches on the inside and are available instantly for the four speeds as given by the usual step cones. There are numbers cast on the cover of the speed box which indicate in what position the levers should be brought for the different changes of speed. The small handle shown on the front of the box in Fig. 1 is employed for locking the one lever when the other is in use.

The two levers R in Fig. 2 are used to engage the friction clutches T by means of the forks S with either of the gears EFGH on the motor driven shaft A. These gears mesh with the gears IJKL on the shaft B. The gears K and L also engage with gears NPQM connecting with shaft C and the latter by means of mitre gears drives the center shaft D in the column of the radial drill.

The gear O which is on the tumbler is used for obtaining a reverse motion for tapping, etc., and is then engaged with the gear L and in this way the gear M is driven in the opposite direction.

All starting and stopping of the machine is controlled by a loose ring encircling the column which when moving the bar X causes the sleeve W to turn in its bearings and bring the rack Y, the rod V and the fork U back and forth. This engages either of the friction gears M or N to the shaft C and in changing from M to N double the speeds derived from the shaft A are delivered to the shaft C and by using back gears and back gears out as provided on the machine, the usual sixteen speeds are obtained at the work spindle.

This speed box is also made in a form suitable for driving by plain pulleys instead of the motor.

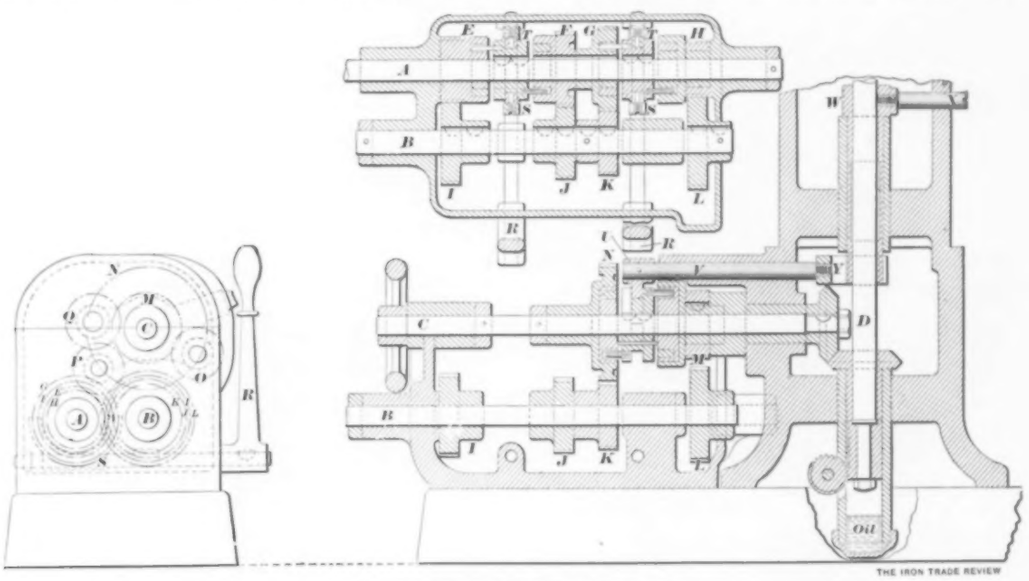

FIG. 2.—DETAILS OF NEW SPEED BOX.

Lake Superior Iron Mines.

The pumps and other machinery of the Iron Belt mine on the Gogebic range have been hauled to the surface and no more ore will be mined. The first ore was taken from this mine in 1888 and the total mined up to last year was 1,092,507 tons.

The United States Steel Corporation has just completed the steel shaft house at the Sibley mine at Ely, Mesabi range. It is 160 feet high and the ground dimensions are 35x75 feet. The machinery hoists the ore, dumps it into a screen chute, which separates the fine from the lumps, and turns it into channels leading to the cars on the tracks beneath. It is said to be the highest and most complete shaft house in the United States.

Capt. James H. Rough, who was recently made assistant superintendent of the Cleveland-Cliffs Iron Co's. mines, gave a dinner recently at the Cleveland-Cliffs club room, Ishpeming, Mich., to thirteen of the men who had borne the brunt of the great work of sinking the shaft at the Maas mine, Negaunee. The company expressed its appreciation of the services of these men under the trying conditions encountered at the Maas shaft by handing each an envelope containing a check for $50.

James Geary, of Hibbing, has a new mine on the Mesabi situated in the southeast quarter of the northwest quarter of section 25, 58-17. The deposit is on the Robinson-Flynn lands and is but a short distance from the Pettit mine. The mine consists of a forty-acre tract. The ore body runs in many places to a depth of over three hundred feet. Mr. Geary has had a drill on this property for the past six months and has touched the ore bottom in some five holes at a depth of from two hundred and fifty to three hundred feet. In some one or two holes the bottom was not reached and the drill was pulled when still in ore. It is estimated that over three million tons of ore is now determined on the forty and drilling will still continue for a month or two, Mr. Geary has associated with him in this property Capt. John Pearce, of Duluth, and a number of citizens of Virginia.

The steamer William Edenborn, belonging to the fleet of the United States Steel Corporation, broke all big cargo records on the lakes Aug. 1, when that steamer left Escanaba with 8,700 gross tons or 7,744 net tons of iron ore for South Chicago. The big boat was drawing nearly twenty feet of water. On three successive trips, the Edenborn has broken records, but today's performance is nearly a thousand tons larger than any lake vessel ever before carried.

12-INCH DUPLEX LATHE.

The manufacturing lathe shown in Fig. 1 was designed for turning all kinds of light work that must be machined with accuracy and expedition. The machine is built with two independent and complete lathe beds mounted on one rigid base hollowed out for the reception of chips, etc., mounted on one rigid base. The novelty of this machine consists in the unique method of transmitting the feed motion to the slide rest in whatever position it may be located. The tool slide is rigidly fastened by means of three bolts to a lug, cast on one side of the bed, and can be turned to any position in the 360 degrees. A feed shaft extends along the front of each lathe bed and has at the end a worm and worm gear connection with a vertical shaft leading to the pair of small bevel gears driving the transverse screw of the compound rest.

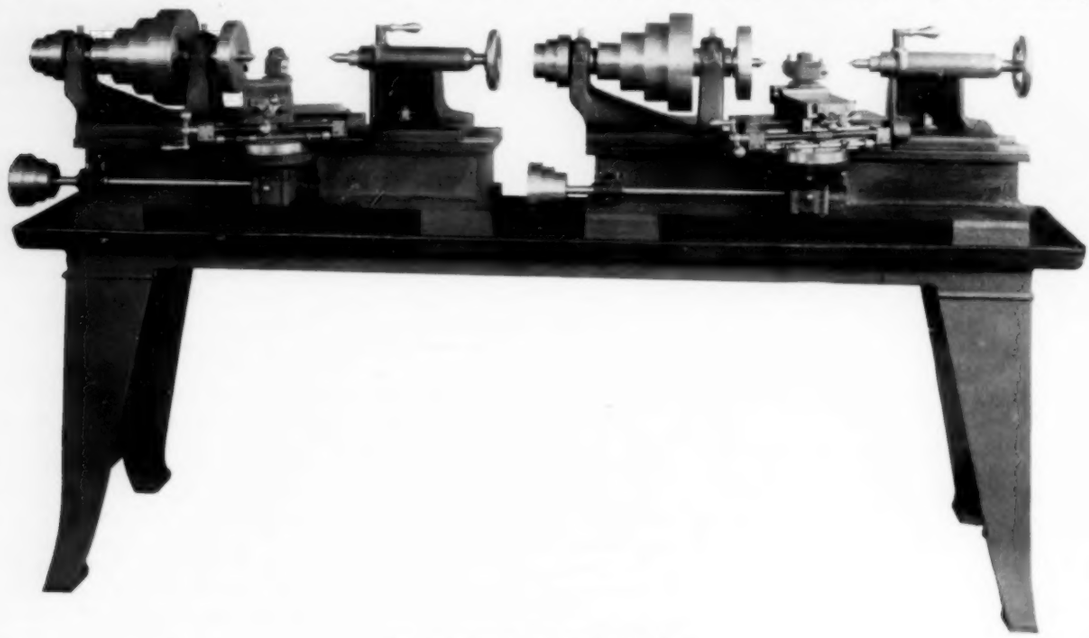

FIG. 1.—THE RESEK DUPLEX LATHE.

The slides are provided with automatic feeds in either direction with adjustable stops. The gearing is all enclosed and protected from chips.

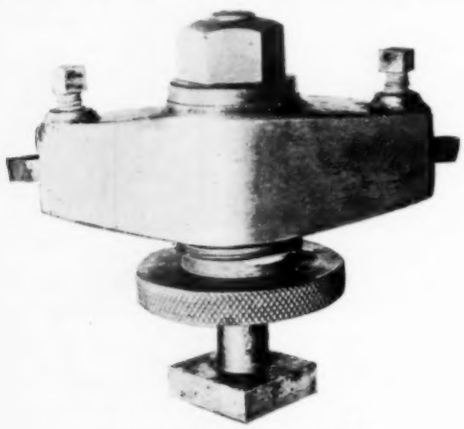

FIG. 2.—DOUBLE TOOL HOLDER.

The Resek tool holder furnished with this machine, and illustrated in Figs. 2 and 3, is an improved design, can be adjusted vertically, and has a cutter of self-hardening steel at each end. The lower bushing is threaded into the body of the holder, and by turning the bushing the tool holder is lowered or elevated as desired. When the proper position is obtained, the holder is securely fastened by means of the nut shown on top. By releasing this nut the tool can be turned and used at either end. This machine and tool holder is manufactured by the Resek Machine Tool Co., of Cleveland.

BURSTING SPEEDS OF EMERY WHEELS.

In *The Iron Trade Review* of June 25, was printed a paper read by Prof. C. H. Benjamin of Case School of Applied Science, before the Saratoga meeting of the American Society of Mechanical Engineers, on "The Bursting Speed of Emery Wheels." A discussion on the paper by Fred A. Waldron appeared in our issue of July 2, Mr. Waldron calling attention to the large factor of safety provided by reputable makers of emery wheels, and making the point that generally the bursting of emery wheels may be traced to carelessness on the part of the operator and to improper mountings, badly designed and poorly adjusted rests and improper and ignorant handling of the emery wheel dresser. The impression was conveyed by the discussion at Saratoga that the experiments at Case School had furnished new data as to the strength of emery wheels. As bearing upon this our attention is called to the tests conducted in 1891 by Coleman Sellers, J. E. Denton and Alfred R. Wolff, to determine the comparative value of 15 varieties of solid emery wheels. The results of these tests were submitted to the Tanite Co., of Stroudsburg, Pa., of whose wheels 36 out of a total of 78 were employed in the tests. None of the 36 wheels burst. The report of the above committee contains the following data:

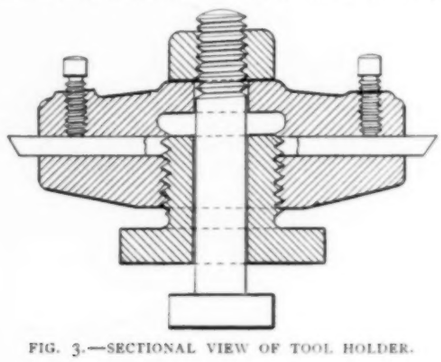

FIG. 3.—SECTIONAL VIEW OF TOOL HOLDER.

Number of wheels tested	78
Number of wheels burst	14
Number of trials attempted	193
Number of trials completed	136
Average metal removed per minute, in ounces	2.108
Average metal removed per minute, at 112 lbs. per sq. in	1.409
Average metal removed per min., at 266 2-3 lb per sq. in.	5.130
Average loss of wheel material per minute	.590
Average initial cut per minute	1.955
Average final cut per minute	1.264
Average maximum cut per minute	5.662
Average minimum cut per minute	.118

The report contains the following definition of a good wheel, and tells in addition how the relative merits of wheels were determined.

"It was agreed that, to constitute a good solid emery wheel, the following qualities should be combined: Safety under the widest conditions of use and misuse; rapidity of cut; freedom of cut at moderate pressure; reasonable amounts of wheel loss and power consumption; evenness of wear; general staying quality; and reliability under the widest range of circumstances.

To determine what wheels were good, some thousands of trials were made with a "machine so constructed that the wheel and work were brought in contact by definite and measurable pressure without any obstacle being interposed to the free wear of either metal or wheel. The results approximated closely to those obtained by hand pressure and yet were independent of all influence from the operators of the machine. The power consumed was measured by a dynamometer attached to the driving shaft and the speed recorded by a tachometer. The resistance between wheel and metal was indicated continually by a standard scale.

"Of the fifteen varieties six were found too unsafe to warrant their general use, 57 percent of the wheels bursting under the same conditions which other wheels passed through uninjured. Eleven varieties (among which are included the six unsafe varieties) were found to be such slow cutters that the average metal removal of ten of them was less than the general average of all the wheels. Of the fifteen varieties only four were found to be rapid cutters.

"The rivalry was narrowed to two wheels. One striking feature characterized these two. That is, that in every series of trials these wheels increased in productive capacity, the average of the last cuts of all the series being greater than the average of all the first cuts. The thirteen other varieties all decreased in productive capacity, the average of the last cuts being less than the average of the first. Some of these which made a brilliant show at the start cut scarcely anything at the close.

"Of the six varieties declared too unsafe for general use three were not submitted to the heavy test at 266 2-3 lbs. per square inch. At 112 lbs. their average minute metal removal was only 0.688 oz. They only completed one-half of their prescribed and attempted trials (24 out of 46). Their average maximum cut per minute was 2.294 oz.—their average minimum only 0.042 oz. Three of them declined at times to cut."

A German report on the same subject is also of interest. It is a preliminary report of Prof. M. Grübler, of the Technical High School, Dresden, Germany, concerning tests made by instruction of the Association of German Engineers. It is dated May, 1902. Some of the details are given below:

Number of wheels tested	54
" complete sets tested	17
" incomplete sets tested	2
Origin of wheels, European	47
Origin of wheels, American	7
Approximate size of wheels, in millimetres	500x50
Approximate size of wheels, in inches	20x2
Ordinary standard working speed, revolutions per min	1,080
Maximum weight of one wheel, in kilos	39.95
Minimum weight of one wheel, in kilos	20.01
Maximum circumferential velocity per sec., in metres	110.44
Minimum circumferential velocity per sec., in metres	64.72
Maximum bursting point, in revolutions per minute	4,210
Minimum bursting point, in revolutions per minute	2,520
Average bursting point, in revolutions per minute	3,312
Maximum strength in kilos	251.3
Minimum strength in kilos	73.9
Average strength in kilos	159.1
Binding material of wheels, vegetable	18
Binding material of wheels, mineral	15
Binding material of wheels, chemical	14
Binding material of wheels, unknown	4
Binding material of wheels, animal	3

In order to straighten out the involved affairs of the Wheeling Roofing & Cornice Co., of Wheeling, W. Va., the new directorate of the company intends to make all the stockholders either plaintiffs or defendants in a chancery suit. Among the claims against the company is one for $6,000 presented by the Youngstown Steel Roofing Co. It is said that the assets exceed the liabilities and that all claims will be adjusted to the satisfaction of the creditors.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

P. Delaney & Co., New York, have been incorporated to manufacture boilers and engines, capital $100,000.

The Lewis Gas Engine & Machine Co. has been incorporated under the laws of New Jersey with a capital of $30,000, of which $16,000 is paid up. The incorporators are: Edward H. Thorne, of New York; John M. Coryell, of Mt. Vernon, N. Y.; and Henry D. Gould, of Newark.

The Red Wing Boat Mfg. Co., Minneapolis Minn., has been incorporated with a capital of $50,000 to engage in the manufacture of boats and engines and to conduct in connection therewith a foundry and machine shop.

The Jacobson Gas Engine Co., Jamestown, N. Y. has been organized with a capital of $1,000,000. The directors are: Charles Jacobson, M. D. Donham, Jacob Jacobson, E. F. Frederickson, M. J. Michaelson, Anders Johnson, D. C. Allen and W. H. Allen, of Warren, Pa., Oscar Stranberg and Jerome B. Fisher, of Jamestown.

The Iowa Malleable Iron Co., has been organized at Fairfield, Iowa, with a capital of $57,000. The stockholders elected the following directors: E. A. Howard, Fairfield; George H. Robinson, St. Catherines, Canada; Ed. Hunt, Fairfield; Joseph Dain, Ottumwa; Robert Louden, and Charles M. Junkin, Fairfield. The board of directors elected the following officers: President, William Louden; vice president, Joseph Dain; superintendent, George H. Robinson; secretary and treasurer, Thomas Louden.

An organization of capitalists who have secured the option for a site for the erection of a steel plant at Port Colborne, Ont., have filed their application at Toronto for a provincial charter. The company is designated as the Steel Corporation of Canada, and is said to have a paid up capital of $2,000,000. The terms of application set forth that the plant, when completed, will turn out 1,200 tons of finished iron and steel for every working day in the year.

The Parl Furnace Co., Chicago, capital $30,000, has been incorporated to manufacture and deal in stoves, furnaces, etc.

G. D. Gingrich and H. R. Willi have leased the Lehman plant at Williamsport, Pa., and incorporated a business under the name of the National Foundry & Supply Co. The products will be chiefly a full line of transmission machinery. The plant consists of a group of buildings, including a foundry, pattern shop, machine shop, etc., the whole comprising 30,000 square feet of floor space.

The Rostand Mfg. Co., New Haven, Conn., will manufacture and deal in metal polish car racks, curtain pole sockets and brass goods. Its capital is $5,000. Wm. B. McCarthy is president and treasurer, and Albert Brown, secretary.

The Chicago Car & Locomotive Works, capital $100,000, has been incorporated, and has acquired the plant of the Pease Car & Locomotive Works, at Hegewish, Ill. The capacity of the plant is being increased. L. H. Baldwin is president and treasurer, and E. Gaidzik secretary.

New Construction:—

A foundry, pipe manufacturing and core making establishment have been added to the American Sanitary Works, Elizabeth, N. J.

The Crescent Foundry Co., Wilmington, Del., will enlarge its plant by the construction of a new building 45 x 100 feet.

Ground has been broken on the site of the new buildings that are to be erected for the T. H. Buckley Car Mfg. Co., Worcester, Mass. When finished the concern will employ 300 men. The company is capitalized at $250,000.

The plant of the Lalance Grosjean Mfg. Co., Harrisburg, Pa., is to be enlarged by the addition to the foundry of a 60-foot building and the erection of a new pattern shop.

Plans for a five story smith and pattern shop and storage room for the Southwark Foundry & Machine Co., Philadelphia, have been prepared. The walls will be mainly of expanded metal and cement. The building will be 158 x 99.

The plant of the Owensboro Buggy Iron Forging Co.,

Owensboro, Ky., has been erected and will be in operation about Aug. 15.

The Ingersoll Milling Machine Co., Rockford, Ill., has started the erection of a new shop at its plant. The new building is to be 55x220 feet. Concrete will be the principal material used and the building and equipment will cost about $50,000.

The Michigan Bolt & Nut Works, Detroit, is now erecting an addition to its plant 40x500 feet. The company expects to have greatly increased shipping facilities, and also storage room It has purchased additional property along side of the plant, nearly four acres in extent, and thereby increasing the dock frontage by 250 feet.

The Foyer Steel Stamping Co., recently organized, with office at 341 Huron St., Cleveland, expects to begin the construction of its building at Painesville, O., about Aug. 5 and to complete same Sept. 15. The building will be brick construction, 110x44 feet. The company expects to use a 50-h. p. boiler, and from a 30 to 40-h. p. engine, with a 50-light electric machine. Will equip with power presses, and plating plant including a complete machine shop outfit.

The chief engineer of Nelson Morris & Co., is preparing plans for a large car works which the firm will build on Ashland Ave., Chicago. The plant will include a boiler house, blacksmith shop and sheds, besides the main erecting shop, and will cost about $300,000.

The Terrell Iron Foundry, Terrell, Texas, recently destroyed by fire, has been rebuilt, and made its first casting a few days ago.

The Duplex Foundry Co.'s plant at Elyria, O., destroyed by fire recently, has been rebuilt and will soon be ready for business.

The contract for the grading of the grounds for the new steel plant of the Baldt Steel Co., New Castle, Del., has been awarded, as was also the contract for the grading for the new plant of the Brylgon Steel Co., which will join that of the Baldt Co. On the grounds of the Baldt Co., there will be erected three buildings each 300x65 feet. They will be used in the making of steel castings. On the Brylgon property there will be one building which will measure 600 feet by 65 feet.

The Crescent Foundry Co., Wilmington, Del., will erect a new building 100x45 feet, thereby increasing the size of the plant about one-third.

The Niles Car & Mfg. Co., Niles, O., has completed its new blacksmith shop, which is 80x126 feet, equipped with the latest machinery.

The Pittsburg Foundry Co., Denver, Col., has been granted a permit to erect an addition. This is contrary to wishes of residents near the foundry, who threaten to take the matter into court and have the plant condemned as a nuisance. The city attorney has ruled in favor of the company.

The contract for the Walworth Mfg. Co.'s brick and stone foundry, South Boston, has been let. It will be a $75,000 structure.

The town of North Butler, about 1½ miles north of Butler, Pa., is about to be established. It will be the location of a large plant to be erected by the Butler Foundry & Machine Co. The company is composed of Butler and Pittsburg capitalists. Gray iron, malleable and steel castings, a new boltless rail and machinery will be manufactured. The plant will employ about 400 men.

J. M. Elliott, of Birmingham, has been appointed as additional receiver for the property of the Southern Car & Foundry Co., in Alabama. An effort is being made to so arrange matters that the receivers can operate the plants. It is thought that by this means the creditors will be paid in full.

The Norfolk & Western Railway Co. has announced its intention to build 500 new coal cars at the Roanoke, Va., shops, for fall delivery. The cars will have a capacity of 100,000 tons and will have under-frames of steel.

At the Pennsylvania Railroad shops, West Philadelphia, a machine and smith shop 150x50 feet will be erected.

Fires and Accidents:—

The plant of the Wellsburg Heating & Foundry Co., at Wellsburg, W. Va., was burned July 25. The foundry was a new one, having been erected less than two years ago. The building and contents were valued at $22,000; insurance, $9,250.

The plant of the Port Washington Foundry Co., Port Washington, Wis., was damaged by fire to the extent of $10,000, July 25. The plant was fully insured.

Fire last week destroyed W. McNicoll's machine shop and foundry, Mt. Vernon, Wash. Loss, $1,000; no insurance.

Wickes Bros., boiler shop, Saginaw, Mich., was damaged by fire to the extent of $2,500, July 25.

The foundry and machine shop of R. Stokes, 30th and Chestnut Sts., Philadelphia, were damaged by fire to the extent of $1,100 July 30.

Fire in the plant of the Clauss Shear Factory, Fremont, Ohio, July 27, caused a loss of $5,000.

The Pittsburg and Valley Districts:—

The plant of the Westinghouse Air Brake Co., Wilmerding, Pa., has been closed down for two weeks for repairs. The annual inventory will also be made during this period.

A large force of men have been laid off by the Pressed Steel Car Co. at its McKees Rocks, Pa., plant on account of a lack of orders. The capacity of the company's plants is 110 cars daily, and while the number of cars booked early in the year exceeded all previous records, the railroads have been placing very few contracts during the past three months.

The installation of the new 10-ton converters at the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., is progressing rapidly and the indications now point to a resumption of the plant on Aug. 20. By the installation of these converters the output of the plant will be increased fully 500 tons a day, and as the company has not sufficient Bessemer iron capacity to supply this plant, it is expected that fully 150,000 tons will have to be purchased in the open market annually. Although it has not been definitely decided, it is probable that additional furnace capacity will be provided within the next two years, to make the Bessemer plant entirely independent of the open market.

The Damascus Steel Co., New Brighton, Pa., which is producing crucible steel according to the Dawson process, has decided to install a 7-ton open-hearth furnace. It is also probable that a small merchant mill will be purchased in the near future.

The Wolf Run Coal Co., of Steubenville, O., has been incorporated with $250,000 capital for the purpose of developing 1,400 acres of coal property on Wolf Run, near Steubenville, O. The incorporators are Henry Wick, William Warner, Hugh B. Wick, Charles Westlake and Cecil D. Hine.

The Bessemer Coke Co., of Pittsburg, Pa., has just completed 135 additional coke ovens in the Klondike region near Connellsville, Pa. With the completion of these ovens the company is now operating 1200 ovens with a daily output of 2,400 tons.

The American Railway Signal Co., of Pittsburg, has been incorporated with $100,000 capital for the purpose of erecting and operating a plant in the Pittsburg district for the manufacture of railway torpedoes, torches, etc. The officers of the company are George M. Coe, president; James L. Devenny, first vice president; F. C. Wilkes, second vice president; F. R. Coe, treasurer; E. A. Schooley, secretary and general manager; Charles G. Tate, mechanical engineer.

The plant of the Bellaire Bridge & Boiler Works operated by Bosser & Castro, Bellaire, O., was destroyed by fire last week entailing a loss of $30,000.

The Westinghouse Machine Co., Pittsburg, is just completing an order for the New York Edison Co., calling for twelve engines of 10,000-h. p. capacity each. Eight of the engines have been installed, two are being placed in position and the remaining two, completing the order, are being prepared for shipment.

The Carlin Machinery & Supply Co., of Allegheny, Pa., will be granted a Pennsylvania charter on Aug. 21. The company has been operating a large new and second hand machinery plant in Allegheny for a number of years, but has never been incorporated. The incorporators are John H. Carlin, John R. Eyster and R. W. Oswald.